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ROYAL BOTANIC GARDENS, KEW

XXXIV — THE CULTIVATION OF HYDNOCARPUS
WIGHTIANUS IN NIGERIA. J. D. KENNEDY.

In 1926, at the request of the British Empire Leprosy Relief Association, some experiments were initiated at Sapoba to ascertain the possibility of growing *Taraktogenos Kurzii* King, and other species of the family *Flacourtiaceae*, for the purpose of obtaining Chaulmoogra oil from the seeds, for the treatment of leprosy.

Several parcels of *Taraktogenos* seeds were received for trial from time to time, and sown in the nursery, but no germination was ever obtained. Like most oil-bearing seeds, their germinative capacity is not retained for any length of time and in all probability their viability had perished in transit.

There is a small tree of the same family, *Caloncoba echinata* Gilg, found in forest regions of Sierra Leone, Liberia and Gold Coast, the seeds of which yield an oil similar to Chaulmoogra oil, but so far this species has not been recorded from Nigeria, although it may occur. Supplies of this seed were obtained from Sierra Leone some years ago and sown in the nursery, but no germination resulted.

Two other trees, *Hydnocarpus Wightianus* Blume and *H. anthelminticus* Pierre, are closely allied to *Taraktogenos Kurzii*, and their seeds yield an oil which is used as a substitute for the true Chaulmoogra oil.

There is no doubt that *H. Wightianus* can be grown at Sapoba and considerable success has attended the experiments.

Although no difficulty was encountered in getting seed of *H. anthelminticus* to germinate, subsequent growth has not been nearly as promising as that of *H. Wightianus* and the trees do not thrive. There are 28 young trees of *H. anthelminticus* growing at Sapoba, but so far no flowering has taken place.

H. Wightianus is a common tree in the rain forests of South India, generally in swampy places and as a rule near open water, but it is also commonly found at an elevation of 2000 feet in Travancore.

It is a large evergreen tree, with handsome, dark green, shady foliage. At Sapoba however, its habit is more that of a large bush, having a number of stems arising from ground level and long, drooping, lateral branches.

Climatic conditions in this part of Nigeria are very similar to those found in its natural habitat, where the maximum shade temperature varies from 94° to 99° F. with a minimum of 60°, and an annual rainfall of 90 inches and over.

The climate of Sapoba is typical of the equatorial type and is characterised by an abundant, more or less evenly distributed rainfall of 100 inches or more per annum. There is a very small range in temperature throughout the year. Atmospheric humidity approaches saturation point and the average daily shade temperature is about 90° F., rarely falling below 65° or 70° at night. Violent tornadoes are frequent at the beginning and end of the rains, and it is usual to have a brief rainless period about January when the harmattan blows. The harmattan is a hot desiccating wind which blows from the Sahara Desert and is very severe on plant growth.

The soil is a light sandy loam of great depth and uniformity and characterised by an entire absence of rocks of any kind. I am indebted to the Agricultural Chemist, Ibadan, for the following mechanical analysis of the soil taken from the forest at Sapoba.

Depths	Coarse sand 2-0.2 mm.	Fine sand 0.2-0.02 mm.	Silt & Clay 0.02 & lower	Texture.
0-1ft.	85.7	5.1	9.2	9.9
1-2	76.2	8.3	5.5	5.5
2-3	76.7	6.8	16.5	5.0
3-4	74.3	6.2	19.5	4.1
4-5	73.1	6.6	20.3	3.9


No stones, i.e. particles over 2 mm., occurred in any of the samples. Texture = Coarse and Fine Sand/Silt and Clay.

NURSERY TREATMENT.

The original sample of seed of *H. Wightianus* was received from India through the Director of Medical and Sanitary Services, Nigeria, in August, 1926. The seed was examined on arrival at Sapoba and found to be in fairly good condition although there was quite a number of rotten seeds; however, the most viable looking seeds were selected and sown in a prepared nursery bed, on a piece of swampy ground, alongside the Jamieson River on 9th August 1926. The seeds were sown in lines 6 inches apart, and 6 inches between seeds. The beds were shaded and watered night and morning.

Germination, which in this species is epigeous, started in 30 days; the outer shell cracked to allow the radicle to emerge and grow downwards to form the tap root. The cotyledons were forced above ground and development of the seedling was rapid. The primary root was long with a wealth of lateral rootlets well distributed along the tap root.

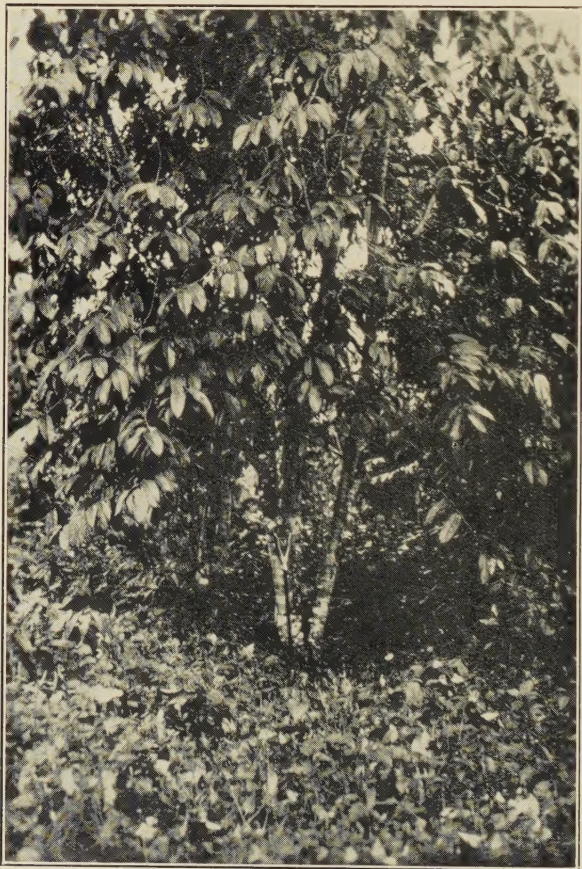
When the seedlings were about a foot high they were lifted from the nursery bed and planted out at 6' x 6' in rainy weather, on a cleared area in the same locality. For a long time they stagnated and did not present a promising appearance but eventually they succeeded in getting away.



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Fruiting branch of *Hydnocarpus Wightianus*



Plant of *Hydnocarpus Wightianus*, seven years old

Early in 1927 the crop was completely defoliated by caterpillars but later new foliage appeared and the plants continued to flourish, except those growing on the edge of the swamp where they were more or less inundated. All went well with the crop for another year when a second caterpillar attack occurred, again resulting in complete defoliation. These sudden caterpillar attacks on an exotic plant which is being tried out for the first time are interesting, particularly when no trace of similar infestation is found on the surrounding vegetation in the neighbourhood.

About this time it became obvious that an espacement of 6' x 6' was much too close, so every alternate plant was lifted and the plot extended, making an espacement of 12' x 12'.

The plants growing on the edge of the swamp nearest the river were undersized and rather sickly looking, so they were lifted and successfully transplanted to higher ground.

At the beginning of November it was observed that the leading shoots of several healthy-looking trees had wilted, and later died back for several inches to form a "collar". Examination showed a small pin hole near the collar and on cutting open the shoot a small egg was found in the pith. Some days later a quantity of frass was observed on the ground at the base of one of the most promising plants and further examination showed that a grub had tunnelled down the entire length of the pith, yet the plant appeared to be perfectly healthy and normal, apart from the wilted leading shoot.

No serious permanent damage was apparent from these borer attacks, which continued to the present time (1935). The presence of the grub probably stimulated the growth of new shoots from ground level.

One tree, four years old, which had been attacked by the borer, produced flowers in 1929, and in 1930 one fruit was obtained, the seeds of which were sown in the nursery and gave 100% germination.

Three trees planted at Zaria in the Northern Provinces in 1928 flowered in 1932 and some fruits were also obtained, resulting from previous flowering which had not been observed.

There is no definite season for flowering or fruiting in this country and it is usual to find in the same plot, and sometimes on the same tree, flowers, young fruits about the size of golf balls, and mature fruits.

The flowers are small and inconspicuous, arising singly or in few-flowered clusters in the axils of the leaves which are arranged in two ranks along the branches.

Mature fruits are brown in colour, have a rough exterior, and are about the size and shape of an orange, while young fruits are almost jet black, have a velvety exterior and are not quite spherical. The fruits have a short stout peduncle and are more or less pendulous from the branches. Although there are generally

three fairly prominent furrows radiating from the apex of the fruit and extending about half way towards the base, the berries are indehiscent.

The fruits vary considerably in size and contents and may contain from 10 to 28 somewhat angular seeds bluntly pointed at the hilum end, and rounded at the other, with a hard and brittle, wrinkled, black seed coat which turns grey when dry. The seeds measure, on the average, about one inch long and half an inch at their widest part. Each is enveloped in a clear gelatinous substance and embedded in a sweet smelling yellowish pulp. From 20 to 25 seeds weigh an ounce.

Squirrels do a considerable amount of damage to the ripening fruits while on the trees, and ground rodents also eat the fallen fruits.

The fruits are harvested as they ripen, and the seed extracted and dried in the sun before sowing in the nursery. Each year more trees are coming into bearing and quantities of seed have been sent for trial to other parts of Nigeria, as well as to the Imperial Institute, South Kensington, and other Institutes for analysis as to oil content, etc.

ANALYSIS OF SEEDS.

In 1932 a sample of locally grown seed was sent to the School of Pharmacy, Yaba, for analysis and the following report was received :—

“The seeds were removed from their endocarps and the oil extracted, using ether as a solvent. So far as we can test the saponification value and the acid value of the oil extracted from local seeds indicate that this oil is of better quality than the Indian Oil. By comparison it is found that local oil has a higher saponification value and a much lower acid value. The oil exists in the seeds to the extent of about 50 per cent. but the yield would be less (about 35 per cent.) if the oil is removed by pressure.

In view of the above findings, and provided the oil and its esters continue to be largely employed in the treatment of leprosy, it may be worth while giving consideration to extraction of oil in Nigeria on a manufacturing scale.

No report has yet been received from the Imperial Institute.

PLANTATIONS.

Efforts are now being concentrated on raising *H. Wightianus* on a large scale and the plantations are gradually being extended as seeds become available. At the present time there are 14 acres under cultivation at Sapoba containing about 2500 trees, out of which 117 are in bearing.

In July, 1935, 165 fruits were collected from one tree but this is exceptional. In the meantime the following table gives some idea of the present yield of fruit from a plot of 475 trees :—

Date of Harvest	No. of trees in bearing	No. of Fruits	Average No. per tree	Average No. of seeds per fruit	Remarks.
Feb. 1930	1	1		28	No other data recorded.
Jan. 1932	5 lbs of seeds				
" 1933	31	97	3.1	21	No other data recorded.
" 1933	2lbs of seeds				
March 1933	14	207	14.8	23	Entire fruits sent to school of Pharmacy Yaba for analysis. One tree yielded 165 fruits.
May 1933	64	549	8.6	19	
June 1933	17	88	5.1	17	
Feb. 1934	51	563	11.0	18	
May 1935	42	505	12.0	18	
" 1935	7	293	41.8	20	
June 1935	16	171	10.6	17	
July 1935	23	289	12.6		
" 1935	17	433	25.5	26	

The locally-produced seed gives a much higher germination percentage than does imported seed, and this species is easily raised in the nursery provided the seed is sown soon after collection.

Experiments have proved that the best age for transplanting plants to the field is one year old. If the plants remain in the nursery for two years the tap root is exceedingly long and in some cases has been measured and found to go down to a depth of 6 feet. Young plants will not tolerate root pruning but the stem can be cut hard back and will sprout again.

It is an advantage when laying down a plot to leave a certain amount of light top shade standing on the area.

Various espacements from 6' x 6' to 30' x 30' have been tried of late years and it is anticipated that about 20' x 20' will be found most suitable.

The following table shows the maximum and average height of plants over a period of years :—

	1928	1929	1930	1931	1932	1933	1934	1935
Maximum	9' 7"	11' 1"	15' 0"	18' 6"	23' 0"	27' 6"	31' 6"	34' 0"
Average	6' 8"	7' 6"	12' 6"	15' 0"	18' 6"	20' 0"	22' 6"	25' 0"

XXXV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXVII.*

NOTES ON THE MEXICAN SPECIES OF THE GENUS *BURSERA*.—A. A. BULLOCK.

INTRODUCTION.

The present studies were undertaken with a view to providing names for a series of specimens of *Bursera* included in a large collection of Mexican plants sent to Kew during the last few years by Mr. G. B. Hinton. The specimens were collected in the relatively small area covering the districts of Temascaltepec, Coyuca and Huetamo, in the states of Mexico, Guerrero and Michoacan. This important intensive collection is still proceeding, and up to the present 160 numbers of 20 species of *Bursera* have been received; two species are omitted, as they appear to be undescribed, and the material is not yet sufficiently complete.

Thanks to the generosity of the authorities at the Berlin, Paris and Copenhagen herbaria, the writer has had the privilege of examining most of the types enumerated by Engler¹ in the first general review of the genus that can be regarded as modern. This was based on Schlechtendal's² enumeration and notes, but included many more species. The next important work on the genus was by Rose³, and here Kew is indebted to the authorities at the United States National Herbarium, Washington, for the loan of most of the type material of species published later than Engler's monograph. In the light of the abundant material now available, Rose's work requires modification, his concept of species having been too narrow. This was realised by Standley⁴ who reduced to synonymy a great proportion of the species established by Rose and others. On the whole, the writer agrees with Standley's reductions, but one or two important differences have been made in the present treatment, based on the exceptional opportunity which has presented itself of gathering together a long series of specimens of each of the species concerned.

The plants included by various authors under the names *B. fagaroides*, *B. odorata*, and *Elaphrium confusum*, constitute an extremely critical group, the diagnostic characters of which are by no means clear. The types of all three are in different stages of development, so that comparisons based on the descriptions are apt to be misleading; the only method of approach is by the examination of long series of specimens that are demonstrably conspecific, and thereby finding characters by which these and other species differ constantly from each other.

* Continued from K.B. 1936, 221.

¹ Engler in DC. Monogr. Phan. **4**, 36-60 (1883).

² Schlechtendal in Linnaea, **16** (1842) et *l.c.* **17** (1843), sub *Elaphrio*.

³ Rose in N. Amer. Fl. **25** (1911), sub *Elaphrio*.

⁴ Standley in Contr. U.S. Nat. Herb. **23** (1923) sub *Elaphrio*.

These remarks apply also to such species as *B. jorullensis*, *B. excelsa*, *B. penicillata*, *B. glabrifolia*, and *B. ovalifolia*, to mention only a few, and it may be safely said that, in every case, either the original specimens were too incomplete for an adequate description to be drawn up, or the description omitted one or more points of prime importance.

By collecting specimens from marked trees at different seasons of the year, Mr. Hinton has shown that certain differences between young flowering material and old fruiting material, which have been used diagnostically, are of no value, and that extreme care must be exercised in selecting characters for specific differentiation. Thus characters involving the amount, as distinct from the quality of the indumentum, are valueless in this as in many other genera; the texture of the leaves also can be shown to vary (in dried specimens) according to their age on collection, the method of drying, and particularly on the exact habitat conditions of light and shade. On the other hand, the shape of the seed, the colour of the aril-like pulp more or less surrounding it, and the number of valves of the drupe, are reliable specific characters which have not hitherto received the attention they deserve.

Some of the "doubtful" species listed by Engler, Rose and Standley, have been identified during the course of the work. In the case of *B. Tecomaca* the treatment is very different from that adopted by Standley. *B. Kerberi*, which he regarded as an independent species, is now reduced to *B. Tecomaca*, while *B. fragilis*, which he cited as a synonym of *B. Tecomaca*, is here referred to *B. lancifolia*.

Bursera Simaruba (L.) Sarg., not definitely admitted to occur in Mexico by Rose, is included by Standley, who gives five synonyms based on Mexican plants. A study of the West Indian material at Kew leads one to the opinion that it does not occur as a native plant in Mexico, but may have been introduced. Of the synonyms given by Standley, *Elaphrium ovalifolium* Schlecht. (doubtfully included), united with *E. acuminatum* (Rose) Rose, is maintained as a species, and of the remainder, to which may be added *Elaphrium longipes* (Rose) Rose, it is perhaps better to express no opinion until more material of each is available. As far as the type specimens are concerned, they appear to be distinct, and this is particularly so in the case of *E. arboreum* (Rose) Rose.

It is hoped that figures of the newly-described species and of others of a hitherto doubtful nature, may be published in an early number of Hooker's *Icones Plantarum*.

The various herbaria in which the specimens cited are to be found are indicated by the following letters in parentheses after the collector's numbers:—K=Kew, B=Berlin, P=Paris, C=Copenhagen, U=United States National Herbarium, Washington, D.C. Where no special indication is given, the specimen is in the Kew Herbarium.

Finally, I wish to express my indebtedness to Dr. T. A. Sprague, Deputy Keeper of the Herbarium, Kew, without whose help, criticism and encouragement this investigation could not have been undertaken.

ECONOMIC NOTES.

Several species of *Bursera* have been exploited commercially, mainly on account of the high percentage of fragrant essential oil in the wood and fruit, and also to a less extent for the sake of their resins. Many are used locally as a source of incense, and all Mexican works on *materia medica* contain references to their value in medicine, particularly in the treatment of uterine diseases; they are also used in the preparation of surgical dressings. The resin of some species is valued for the manufacture of varnishes; on dissolving the resin in turpentine, varnish of high quality is obtained.

Perhaps owing to the unsettled nature of large areas in Mexico, the commercial possibilities of the individual species have never been thoroughly tested or fully exploited, and the taxonomic difficulties encountered in dealing with the genus render it impossible to refer with certainty any product to a definite species. There is no doubt that trade names apply to products derived from several species.

An account of Mexican Linaloe oil is to be found in Finckmore, "The Essential Oils" p. 479 (1926), where the source of supply is stated to be *B. Delpechiana* or *B. Aloëxylon*. In the present paper these two species are united with *B. penicillata* and *B. glabrifolia* respectively. *B. fagaroides* is also mentioned as producing an oil with the odour of caraway. A similar account is given in the second English edition of Gildemeister, "The Volatile Oils," 3, p. 118 (1922). In both the above accounts, copious references to the original places of publication of the information, mainly in the "Perfumery and Essential Oil Record," are given, and need not be repeated here.

Probably the first notice of the Mexican product in this country was in 1869, when Collins published an account of "The Lignalee Wood of Mexico" in Pharm. Journ. Ser. 2, 10, 590-593 (1869). In this article "*Amyris Tecomaca* DC." and "*Elaphrium graveolens* H.B.K." are given as the source of supply, but there is little doubt that this is erroneous*, and that *B. penicillata* and *B. glabrifolia* are the species most concerned.

The next important account is by Holmes, in Perf. & Ess. Oil. Rec. Mar. 1910, pp. 57-60, where there is a description of the tree, and a rather poor figure purporting to be of "*B. Delpechiana*." A comparison between the wood-structure of *B. Delpechiana* (*B. penicillata* of this paper) and *B. Aloëxylon* (*B. glabrifolia*), is given,

* But see also Heller, Reis. Mex. 426 (1853), where *Amyris Tecomaca* is also referred to as a source of oil. Only the difficulty in checking the identification renders this doubtful; the plant may well be of use as an oil producer.—A.A.B.

and also an account of the physical and chemical properties of the oil, which is produced by Mexican Indians in a very primitive manner, mainly from the wood of trees 40-60 years old. Various wounding operations are carried out on younger trees, which induce the secretion of oil as a pathological product. No attempt at regeneration is made, although the plant grows readily from twigs stuck in the ground, without any preparation or care. Some oil is prepared from the drupes, but this is of poorer quality, and is usually mixed with the wood oil.

In 1910, Mr. P. J. Anderson, accompanied by Mr. G. N. Humphries*, went to Mexico to study "*B. penicillata*" in its native home, and eventually the former opened a plantation in India, where the plant was grown from the seed he had collected in Mexico. Using modern distilling plant, he has been able to obtain from the dried drupe valves an oil of good quality. The late Prof. Sir I. Bayley Balfour took a great interest in the experiment, and cuttings from Mr. Anderson's Indian plantation were grown in the Royal Botanic Garden, Edinburgh. A report on the Indian oil, compared with the native-produced Mexican variety, appeared in Bull. Imp. Inst. 29, 182-3 (1931).

Elemi is the name given to a number of oleo-resins derived from different botanical sources. Probably all belong to the family Burseraceae. Manila Elemi is the most important commercially, but some comes from Mexico, probably collected from several species, including *B. jorullensis* and *B. copallifera*. It is doubtful whether *B. elemifera* can be regarded as a source of supply. The resin is used in the preparation of ointments, lithographic inks and varnishes.

On the whole, little is known concerning the great majority of species, and it seems likely that a careful examination of many of them, and controlled exploitation, would prove profitable. At present, apparently, no control is exercised, and the oil-yielding trees are being rapidly exterminated.

The following authorities, all yielding some information concerning the economic uses of species of *Bursera*, have been consulted, in addition to those mentioned above:—

GUIBOUT, *Hist. Nat. des Drogues*, 3, 491 (1849-51).

WOOD ET BACHE, *U.S. Dispensatory*, 324, 1309, 1396 (1854).

ROSENTHAL, *Synops. Pl. Diaph.* 865-866 (1862).

ANDRES, *Fabrication of Volatile and Fat Varnishes*, 63-64 (1882).

WITTSTEIN, *Handw. Pharmakog. des Pflanzenr.* 379 380, 832 (1882).

FLUCKIGER ET HANBURY, *Pharmacographia*, 152 (1879).

PLANCHON ET COLLIN, *Les Drogues Simples*, 2, 556-560 (1896).

* See Simmonds in Perf. and Ess. Oil Rec. Dec. 1934, 378-9. Living plants, sent to Edinburgh from India by Mr. Anderson, have been received at Kew after this paper went to press; they represent *B. glabrifolia* and *B. jorullensis*.

DRAGENDORF, *Die Heilpflanzen*, 370–371 (1898).

PARRY, *Chem. of Essential Oils and Artificial Perfumes*, 449–453 (1908).

TSCHIRCH, *Hanbd. der Pharmakog.* **1**, 408–409 (1909) ; *l.c.* **2**, 832–835 (1912) ; *l.c.* **3**, 1136 (1925).

WIESNER, *Die Rohst. des Pflanzenr.* 4 Aufl. **1**, 88 (1927).

ANATOMY.

Very little is known concerning the anatomy of any species of *Bursera*. The West Indian *B. gummifera* has been examined more closely than any other, but even in this case much remains to be done. It is not the purpose of this paper to examine the anatomy of the genus, but a few selected references are given below for the convenience of future workers :—

(1) Solereder, transl. Boodle et Fritsch, *Syst. Anat. Dicot.* **1**, 190 ; **2**, 869 (1908), cum bibliogr.

(2) Guillaumin, *Recherches sur la Structure et le développement des Burseracées. Application à la Systématique.* (Thesis : Paris, 1910).

(3) Record et Mell, *Timbers of Trop. Amer.* 337–8 (1924).

Most of the anatomical work done on the family concerns Asiatic species, but Guillaumin refers to some Mexican species in a very cursory manner. A comparison between the woods of *B. penicillata* and *B. glabrifolia* appeared in *Perf. & Ess. Oil. Rec.* Mar. 1910, 60, but this was too incomplete to be of permanent value.

It is hoped that suitable wood-samples will become available for study at Kew and elsewhere in the near future.

TAXONOMY.*

The following key, based mainly on the characters of the mature leaflets, includes all the Mexican species except *B. submoniliformis*, *B. heterophylla*, *B. longipedunculata*, *B. arborea* and *B. Karwinskii*. These are too incompletely known to render their inclusion useful. Most of the specimens seen can be identified by applying the key with some freedom. The presence or absence of wings of the leaf-rachis, used as a primary key character by both Rose and Standley, has proved to be unreliable, and I have discarded it. Apart from the primary dichotomous division, no attempt to arrange the species according to a natural classification has been made ; in the present state of our knowledge of the genus, such an arrangement would present insuperable difficulties from the point of view of the construction of a workable key. On the other hand, many groups of closely allied species, which were widely separated by both Rose and Standley, have been brought together.

In a few cases where the mature fruit is unknown, I have assumed that tetramerous flowers will give rise to two-valved drupes, and

* The generic name *Bursera*, antedated by *Terebinthus*, is conserved.—A.A.B.

trimerous flowers to three-valved drupes. More use might, perhaps, have been made of inflorescence characters, but in view of the fact that many species are unknown in the flowering stage, and that the distribution of the sexes, as well as the effect of such distribution on the form and size of the inflorescence, still remains to be investigated, it was considered advisable to omit such characters even where known.

Obviously a considerable amount of field work remains to be done, and any deficiencies that may be discovered in the key will indicate the direction such field work should take.

KEY TO THE MEXICAN SPECIES OF BURSERA.

Drupae bivalves; flores tetrameri:

Folia \pm bipinnata; semina dimidio inferiore arillo induta:

Foliola parva, usque ad 1 cm. longa:

Foliola integerrima, \pm rotundata *B. bipinnata*

Foliola marginibus crenis paucis irregulariter dispositis

praedita, anguste elliptica vel lanceolata vel

oblanceolata *B. stenophylla*

Foliola majora, usque ad 3 cm. longa, \pm regulariter

crenata vel dentata:

Foliola acuta vel acuminata:

Folia glabra vel parcissime pubescentia *B. elemifera*

Folia satis dense pubescentia *B. collina*

Foliola utrinque obtusa vel rotundata *B. diversifolia*

Folia unifoliolata vel simpliciter pinnata:

Folia unifoliolata:

"Nervi laterales numerosi, late patentes" *B. cerasifolia*

Nervi laterales 5-8, adscendentes *B. Hindsiana**

Folia trifoliolata:

Folia utrinque \pm dense pubescentia *B. Hindsiana*

Folia glabra vel utrinque parcissime pilosa *B. biflora*

Folia 5- ∞ foliolata:

Semina dimidio inferiore arillo induta:

Foliola crenis paucis satis profundis praedita:

Foliola subtus parce pubescentia vel glabra *B. laxiflora*

Foliola subtus pubescentia vel tomentosa *B. filicifolia*

Foliola \pm regulariter serrato-crenata:

Foliola apice rotundata, supra \pm nitida *B. glabrifolia*

Foliola apice acuta vel acuminata:

Rachis foliorum nodis penicillato-barbata;

folia ceterum pilis brevis \pm induta vel

glabra *B. penicillata*

Rachis foliorum nodis haud penicillato-barbata;

folia pilis longis utrinque vestita *B. coyucensis*

Semina tota vel fere tota arillo induta:

Foliola anguste lanceolata, usque ad 8 cm. longa,

supra nitida, subtus albido-tomentosa *B. bicolor*

Foliola haud lanceolata, plerumque latiora:

Foliola crenis paucis satis profundis irregulariter

praedita; inflorescentiae graciles, 2-vel

pauciflorae:

Foliola glabra vel subtus parce pubescentia *B. laxiflora*

* I have seen no fruit of this plant. Brandegee states that he has seen the plant with 1-9 leaflets, but I have seen no specimen showing more than three.—A.A.B.

- Foliola subtus dense pubescentia vel tomentosa*B. filicifolia*
 Foliola regulariter crenata vel dentata :
 Foliola supra valde rugosa, leviter pubescentia,
 subtus pubescentia usque tomentosa*B. jorullensis*
 Foliola supra velutina, subtus tomentosa :
 Foliola elliptica vel ovata, 3-5-jugata, circiter
 5 cm. longa*B. excelsa*
 Foliola oblonga, 9-12-jugata, usque ad 2 cm.
 longa*B. velutina*
 Foliola lanceolata, 4-5-jugata, circiter 2 cm.
 longa*B. copallifera**
 Foliola supra glabra vel pubescentia, subtus \pm
 pubescentia :
 Foliola usque ad 4 cm. longa sed plerumque
 minora :
 Foliola apice \pm rotundata, supra \pm nitida,
 glabra vel parce pilosa*B. glabrifolia*
 Foliola apice acuta vel acuminata :
 Rachis foliorum nodis penicillato-barbata,
 ceterum glabra vel \pm pubescens*B. penicillata*
 Rachis foliorum nodis haud penicillato-
 barbata ; foliola 15-21, supra pilis
 brevibus satis dense vestita, subtus
 dense pubescentia*B. asplenifolia*
 Foliola multo majora, usque ad 14 cm. longa,
 plerumque 6-10 cm. longa :
 Infructescentia 15-25 cm. longa*B. Hintoni*
 Infructescentia circiter 6 cm. longa*B. excelsa*
 Drupae trivalves ; flores trimeri :
 Folia 1-vel 3-foliolata :
 Folia glaberrima :
 Folia semper 1-foliolata, ovata, acuta.....*B. Schlechtendalii*
 Folia 1-vel 3 foliolata, foliolis apice obtusis vel
 rotundatis :
 Folia satis longe petiolata ; foliola oblonga
 usque obovata*B. trimera*
 Folia brevius petiolata ; foliola ovata*B. subtrifoliata*
 Folia semper 3-foliolata, foliolis apice longe caudatis*B. Tecomaca*
 Folia utraque pagina satis dense pubescentia, semper
 3-foliolata*B. trifoliolata*
 Folia 5- ∞ -foliolata :
 Foliola magna, usque ad 12 cm. longa et 7 cm. lata, sed
 plerumque circiter 5 cm. longa et 2.5 cm. lata :
 Drupae pubescentes ; folia subtus praesertim \pm dense
 pubescentia*B. grandifolia*
 Drupae glabrae ; folia glabra vel interdum parce
 pubescentia :
 Foliola integra, ovata, obovata, vel elliptica :†
 Foliola sessilia vel brevissime petiolulata.....*B. ovalifolia*
 Foliola distincte petiolulata*B. longipes*

* I have not seen mature leaves of this plant. *B. submoniliformis* should, I think, come here, but the available material makes it impossible to include it safely.—A.A.B.

† *B. arborea* comes into this group, and may be distinguished by its smaller, more numerous drupes. Having seen only the type, I have been unable to find any good key character to separate it more definitely, though I cannot agree with Standley's treatment of it as conspecific with *B. Simaruba*.—A.A.B.

Foliola serrato-crenata, oblongo-lanceolata	<i>B. lancifolia</i>
Foliola multo minora, vel elongato-oblongo-lanceolata :	
Foliola elongato-oblongo-lanceolata :	
Foliola distante serrato-crenata	<i>B. multijuga</i>
Foliola basin versus tantum serrato-crenata	<i>B. rubra</i>
Foliola anguste linearia, acuta	<i>B. Galeottiana</i>
Foliola linear-oblonga, vel oblonga, interdum valde parvae :	
Foliola multijugata, plerumque latitudine 3-4-plo longa	<i>B. microphylla</i>
Foliola 2-4-jugata, interdum valde parvae, plerumque latitudine sesquilinga	<i>B. arida</i>
Foliola anguste ovata vel elliptica vel obovata, ± crenata vel integra :	
Foliola glabra :	
Foliola apice acuta vel acuminata	<i>B. confusa</i>
Foliola apice obtusa vel rotundata	<i>B. fagaroides</i>
Foliola ± dense pubescentia, apice acuta vel subacuta	<i>B. sessiliflora</i>

ENUMERATION OF SPECIES.*

Bursera arborea (Rose) Bullock, comb. nov. *Terebinthus arborea* Rose in Contr. U.S. Nat. Herb. **10**, 118 (1906). *Elaphrium arboreum* (Rose) Rose in N. Amer. Fl. **25**, 247 (1911).—*Elaphrium Simaruba* Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923) partim, non Rose (1911), nec *Pistacia Simaruba* L. (1753).

Rose states that this is a common tree along the coastal plain of Tepic and southern Sinaloa, but I have seen only the type specimen. It appears to be a distinct species, having smaller and more numerous drupes than any of the other Mexican plants with which Standley unites it under the name *Elaphrium Simaruba*.

STATE OF TEPIC: Between Rosario and Concepcion, July 1897 (fr.), Rose 3259e (U; type).

Bursera arida (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus arida* Rose in Contr. U.S. Nat. Herb. **10**, 118, t. 36 (1906). *Elaphrium aridum* (Rose) Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923).

This is very near to *B. microphylla*, and indeed may be no more than a depauperated form of it.

STATE OF PUEBLA: Near Tehuacán, 1905, Rose and Painter 9985 (U; type); *ibid.* Aug. 1901, Rose and Painter 5864 (B); *ibid.* 1906, Rose and Rose 11424.

Bursera aspleniifolia T. S. Brandeg. in Univ. Calif. Publ. Bot. **3**, 382 (1909). *Elaphrium aspleniifolium* (T. S. Brandeg.) Rose in N. Amer. Fl. **25**, 254 (1911).—*Elaphrium sessiliflorum* Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923), quoad syn., non *Bursera sessiliflora* Engl. (1883).

* Pending the discovery of a natural classification, an alphabetical arrangement of the species has been adopted.

This is certainly not conspecific with *B. sessiliflora* (q.v.), as suggested by Standley; its status must remain doubtful until more material becomes available for study.

STATE OF PUEBLA: San Luis Tultitlanapa, July 1908, *Purpus* 3162 (B, U; type number).

Bursera bicolor (Willd. ex Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 53 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, **4**, 251 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Elaphrium bicolor* Willd. ex Schlecht. in Linnaea, **17**, 625 (1843); Rose in N. Amer. Fl. **25**, 252 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923). *Terebinthus bicolor* (Willd. ex Schlecht) Rose in Contr. U.S. Nat. Herb. **10**, 118 (1906). *Amyris bicolor* Willd. MS. in herb. ex Schlecht. *l.c.* in syn.

One of the very few species concerning which there has never been any doubt or disagreement. The large pinnate leaves, which become almost glabrous above when mature, are persistently and densely tomentose below. The leaflets are long-lanceolate, and when young tend to curl, thus obscuring the tomentum of the lower surface, and appearing to be almost terete and glabrous.

STATE OF MEXICO: District of Temascaltepec; Guayabal, 790 m., June 1933 (fl., young fr.), *Hinton* 4151; *ibid.* (from the same tree), Dec. 1934 (old leaves and stems only), *Hinton* 7129; Ixtapan, 1000 m., May 1933 (fl.), *Hinton* 3913; *ibid.* May 1935 (fl.), *Hinton* 7730.

STATE OF GUERRERO: Pungarabato, District of Coyuca, June 1934 (fl.), *Hinton* 6128; *ibid.* Nov. 1934 (fr.), *Hinton* 6958; Taxmalac, Oct. 1904 (fr.), *Seler* 4267 (B).

STATE OF MORELOS: Lava fields near Cuernavaca, 1500 m., June 1896 (young fr.), *Pringle* 6325; *ibid.* May 1898 (fl.), *Pringle* 6844 (K,B); *ibid.* Sept. 1903 (fr.), *Rose and Painter* 6958 (C); "In regione Real de Huantla ad S. Francisco Jetecala aliisque terrae Mexicanæ calidioris locis Junio florentia.....Aug. et Septembri fructifera," *Schiede* num. Schlecht. non cit. (type; not seen); *ibid.* *Knechtel* 702 (herb. Vindob., teste Engler; not seen).

STATE OF VERA CRUZ: San Carlos, Dec. 1842 (fr.), *Liebmann* 32 (C).

Without exact locality: *Karwinski* s.n. (herb. Monac., teste Engler; not seen).

Bursera biflora (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus biflora* Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium biflorum* (Rose) Rose in N. Amer. Fl. **25**, 253 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923).

STATE OF PUEBLA: Near Tehuacán, Aug. 1897 (fr.), *Pringle* 6686 (U; type); *ibid.* Aug. 1901, *Rose* 5903 (U); *ibid.* June 1912, *Purpus* 1299 (B); *ibid.* Dec. 1841 (fr.), *Liebmann* 12338 in herb. Mus. Bot. Haun. (C); Tlacuiloltepec, July 1909 (fr.), *Purpus* 4068 (B).

Bursera bipinnata (Sessé et Moc. ex DC.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 49 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249, fig. 146 G—M (1896); Riley in Kew Bull. 1923, 167. *Amyris bipinnata* Sessé et Moc. ex DC. in DC. Prodr. **2**, 82 (1825); Alph. DC. Calq. Dess. t. 197 (1875). *Elaphrium bipinnatum* (Sessé et Moc. ex DC.) Schlecht. in Linnaea, **17**, 631 (1843); Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923). *Terebinthus bipinnata* (Sessé et Moc. ex DC.) W.F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Rhus filicina* Sessé et Moc. ex DC. in DC. Prodr. **2**, 67 (1825); Alph. DC. Calq. Dess. t. 189 (1875).—*Bursera gracilis* Engl. in DC. Monogr. **4**, 50 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus gracilis* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium gracile* (Engl.) Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923).—*Bursera bipinnata* var. *pilosa* Engl. MS. in herb. Berol.—*Bursera bipinnata* var. *ovalifolia* Donn. Smith MS. in herb. Berol.

The reduction of *Bursera gracilis*, distinguished from *B. bipinnata* by Engler mainly on account of its more or less pubescent leaves, was suggested by Standley, and the long series of specimens now available for study leaves little doubt that it is merely a form with reduced leaves. The pubescence, relied upon by Engler, is of no diagnostic value. The relative length of calyx and corolla, made use of by Rose and later by Standley to separate them is also of no value, quite as much variation in this respect being observable in a single inflorescence as was used by them for specific differentiation. The leaves vary from almost the completely bipinnate to the simply pinnate condition, a whole leaf in the latter case often being comparable in size with a single (lower) pinna in the former.

The closely allied *B. stenophylla* with its larger, more diffuse leaves, narrower leaflets, and smaller aril, is sufficiently distinct.

Mr. Hinton has enriched the already good representation of *B. bipinnata* at Kew by 14 magnificently collected numbers, as indicated in the enumeration below.

The type specimen of *B. gracilis* in the Paris herbarium (also a portion at Berlin), bears the legend "Xochiculco, 30 June 1866", with no indication as to the collector. It is a flowering specimen, with young leaves. I have been unable to trace the locality. There is, however, a village of Xochicalco, 18 miles west of Cuernavaca (Morelos).

STATE OF MEXICO: District of Temascaltepec; Temascaltepec, 1800 m., May 1932 (fl.), *Hinton* 813; *ibid.* 1750 m., June 1933 (fl. and young fr.), *Hinton* 4183; *ibid.* Oct. 1934 (fr.), *Hinton* 6789; *ibid.* June 1935 (fl.), *Hinton* 7698; *ibid.* June 1935 (fl.), *Hinton* 7699; Nanchititla, May 1933 (fl.), *Hinton* 3969; Tejupilco, 1340 m., July 1933 (young fr.), *Hinton* 4378; Vigas, Aug. 1934 (fr.), *Hinton* 6512; *ibid.* May 1935 (fl.), *Hinton* 7733; Cañitas, Jan. 1935 (fr.),

Hinton 7296 ; Volcán, Feb. 1935 (fr.), *Hinton* 7332 ; Pungarancho, March 1935 (fr.), *Hinton* 7569 ; Ixtapan, May 1935 (fl.), *Hinton* 7729 ; Villa Neda, May 1935 (fl.), *Hinton* 7795.

STATE OF SINALOA : Near Colomas, Sierra Madre (foothills), July 1897 (fl. and young fr.), *Rose* 1756 ; Cerro Colorado, *Brandeggee* (not seen).

STATE OF TEPIC : Sierra del Nayarit, *Diguet* s.n.

STATE OF JALISCO : Near Guadalajara, June 1889 (fl.), *Pringle* 2572 (K,B) ; *ibid.* June 1886 (fl.), *Palmer* 99 ; *ibid.* rocky bluffs of the Río Grande de Santiago, Oct. 1889 (fr.), *Pringle* 2332 ; Huejotitan, May 1912 (fl.), *Diguet* s.n.

STATE OF COLIMA : Without exact locality, 1880 (fr.), *Kerber* s.n. (B).

STATE OF MICHOACAN : Jorullo, *Schiede* s.n. (K, B).

STATE OF GUERRERO : Acapulco, *Haenke* s.n. (B) ; Sierra Madre, 1700 m., in granitic soil, June 1899 (fl.), *Langlassé* 1050 (Michoacan?).

STATE OF VERA CRUZ (?) : Trapiche de la Concepcion, July 1842 (fr.), *Liebmann* 74 (C).

Also in Guatemala [Dept. Huehuetenango, 1400 m., July 1896 (fr.), *Seler* 3108 (B)].

Bursera cerasifolia T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, **3**, 121 (1891) ; *Rose* in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus cerasifolia* (T. S. Brandeg.) *Rose* in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium cerasifolium* (T. S. Brandeg.) *Rose* in N. Amer. Fl. **25**, 244 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 546 (1923).

The inadequate original description indicates that this is an ally of *B. Schlechtendalii* or *B. Hindsiana*. It has simple (unifoliolate?) leaves, with many wide-spreading lateral veins.

LOWER CALIFORNIA : San José del Cabo, 1890, *Brandeggee* (type in herb. Univ. Calif. ; not seen).

Bursera collina T. S. Brandeg. in *Zoe*, **5**, 204 (1905) ; *Riley* in Kew Bull. 1923, 167. *Elaphrium collinum* (T. S. Brandeg.) *Rose* in N. Amer. Fl. **25**, 248 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 548 (1923).

I have not seen this plant, but it evidently belongs to the same group of species as *B. diversifolia* and *B. elemifera*, and like them may be a hybrid, one parent being *B. bipinnata*.

STATE OF SINALOA : Cofradia, *Brandeggee* (type in Herb. Univ. Calif. ; not seen).

Bursera confusa (*Rose*) *Bullock*, comb. nov. *Elaphrium confusum* *Rose*. in N. Amer. Fl. **25**, 251 (1911).—*Bursera tenuifolia* *Rose* in Contr. U.S. Nat. Herb. **3**, 314 (1895), et *l.c.* **5**, 113 (1897), non Engl. ex. O. Kuntze, Rev. Gen. 107 (1891) ; *Riley* in Kew Bull. 1923, 169. *Terebinthus tenuifolia* (*Rose*) *Rose* in Contr. U.S. Nat.

Herb. **10**, 122 (1906). *Elaphrium tenuifolium* (Rose) Rose in N. Amer. Fl. **25**, 252 (1911).—*Bursera lonchophylla* Sprague et Riley in Kew Bull. 1923, 168.—*Elaphrium odoratum* Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923) partim, non Rose (1911), nec *Bursera odorata* T. S. Brandege. (1889).

Standley united this with Brandege's *Bursera odorata*, but although I have not seen Brandege's type, the various published descriptions lead me to the conclusion that *B. odorata* is more probably a form of *B. fagaroides*, a view which Brandege himself expressed only two years after publishing his species.

B. confusa may be distinguished from *B. fagaroides* by its usually more numerous, acuminate leaflets, pale bark with red lenticels, and by the fact that the inflorescence often elongates to as much as 4 cm.

STATE OF MEXICO: District of Temascaltepec; Cañitas, Nov. 1934 (fr.), *Hinton* 6992; *ibid.* May 1935 (fl.), *Hinton* 7736; Acatitlán, April 1935 (fr.), *Hinton* 7656*; *ibid.* May 1935 (young and old fr.), *Hinton* 7792; Luvianos, April 1935 (fl.), *Hinton* 7660; Palmar, May 1935 (fl.), *Hinton* 7772; Villa Neda, May 1935 (fl.), *Hinton* 7796.

STATE OF SINALOA: Cerro del Muerto, Choix, May 1921 (fr.), *Ortega* 896 (type of *B. lonchophylla*); El Posole, Ahome (fr.), *Ortega* 5569; Lodiago, Oct. 1891 (fr.), *Palmer* 1581 (U, C; type of *B. tenuifolia*).

STATE OF TEPIC: Acaponeta, June 1897 (fl.), *Rose* 1493.

STATE OF JALISCO: Near Tapotla, May 1893 (fl.), *Pringle* 4372 (K; type collection).

STATE OF MICHOACAN: District of Huetamo; Mal Paso, May 1934 (fl.), *Hinton* 6025.

STATE OF GUERRERO: District of Coyuca: Pungarabato, April 1934 (fl.), *Hinton* 5952; *ibid.* June 1935 (fl. and young fr.), *Hinton* 7847; *ibid.* June 1935 (young fr.), *Hinton* 7849; Placeres, June 1934 (fl.), *Hinton* 6102; Chacamerito, Nov. 1934 (fr.), *Hinton* 6953; Cutzamala, June 1935 (fl.), *Hinton* 7846; Querendas, June 1935 (fl.), *Hinton* 7851.

Bursera copallifera (Sessé et Moc. ex DC.) *Bullock*, comb. nov. *Elaphrium copalliferum* Sessé et Moc. ex DC. in DC. Prodr. **1**, 724 (1824); Alph. DC. Calq. Dess. tt. 202, xxxB (1875), saltem quoad fl. et fol.; Engl. in DC. Monogr. **4**, 59 (1883) sub spp. dub.; Rose in N. Amer. Fl. **25**, 257 (1911) sub spp. dub.; Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923) sub spp. dub. *Amyris copallifera* (Sessé et Moc. ex DC.) Spreng. Syst. Veg. **2**, 219 (1825); Oliva in La Naturaleza, **1**, 40 (1869).

The Sessé and Mocino figure given by Alph. De Candolle appears to be a mixture. The picture of a leafy twig with inflorescences shows the latter to be almost as long as the leaves, the lower half or third

* This specimen shows fruit of the previous season, without leaves.

being naked, whereas the picture of the fruiting branch shows the drupes to be solitary on very short pedicels. De Candolle's description, however, applies to the leafy flowering branch, and this is accordingly taken as lectotype.

Mr. Hinton's specimen also shows young leaves and inflorescences, and there seems to be no doubt that it is conspecific with Sessé and Mociño's plant. A new description will be prepared when more complete material becomes available.

STATE OF MEXICO: Pantoja, District of Temascaltepec, April 1935 (fl.), *Hinton* 7647.

Bursera coyucensis *Bullock*, sp. nov., ramis hornotinis pilis longis praeditis, inflorescentiis foliisque longe pilosis, sed ramis annotinis glabris crassis longitudinaliter lineatis distincta; a *B. copallifera* (Sessé et Moc. ex DC.) *Bullock* indumento distincto, foliolis grossius serratis facile distinguenda.

Frutex vel *arbor* parva, 1.5–4 m. alta; rami annotini satis crassi, glabri, longitudinaliter lineati, rubro-brunnei; rami longi hornotini pilis patentibus satis dense induti. *Folia* (adulta) imparipinnata, 3–5-juga, ambitu obovato-ob lanceolata, apice ramulorum congesta vel alterna, interstitiis inter juga late serrato-alatis supra plus minusve nitida, utrinque prominenter longe pilosa, petiolis 1–2 cm. longis dense pilosis; foliolum terminale anguste rhomboideo-obovatum, usque ad 3.8 cm. longum et 1.5 cm. latum, apice acutum basi plus minusve cuneatum; foliola lateralibus sessilia, oblonga vel anguste elliptica, apice subacuta, basi subacuta usque rotundata, saepe leviter inaequilateralibus, superiora usque ad 3 cm. longa et 1 cm. lata, inferiora gradatim minora; omnia marginibus grosse subdupliciter crenato-serrata. *Inflorescentia** ex axillis perularum prius quam folia orta, longissime pilosa, anguste thyrsioidea, ramulis secundariis valde abbreviatis 2–3-floris, pedunculo circiter 1 cm. longo, tota 2.5 cm. longa, circiter 12-flora, bracteis inferioribus linearibus vel filiformibus usque ad 7 mm. longis, pedicellis circiter 2 mm. longis supra medium articulatis. *Flores* flavi, tetrameri, masculi tantum visi. *Sepala* basi connata, triangulari-subulata, fere 3 mm. longa, extra longe pilosa, intus glabra. *Petala* oblongo-spathulata, apice subacuta, 3.5–4 mm. longa, fere 2 mm. lata, extra pilosa, intus glabra. *Stamina* 8, filamentis filiformibus 2 mm. longis, antheris lineari-oblongis 1.5 mm. longis. *Discus* tenuis, crenatus. *Ovarium* abortivum, minutum, globosum, apice stylo trifido coronatum. *Infructescentia* usque ad 4.5 cm. longa, pedunculo usque ad 2 cm. longo; drupae 1–3, ellipsoideae vel plus minusve obovoideae, 8–9 mm. longae, 6 mm. diametro, apice acutae sed vix apiculatae, pallide brunneae, glabrae, ut videtur bivalvatae. *Semina* ellipsoidea, leviter dorsiventraliter compressa, 7 mm. longa, 5 mm. lata; testa nigra; arillus cupuliformis, sicco rugosus, 5 mm. altus.

* Only very young inflorescences have been seen; mature ones may be much longer.—A.A.B.

STATE OF GUERRERO : District of Coyuca ; Coyuca-Querendas, " tree 4 m., flower yellow," April 1934 (fl.), *Hinton* 5961 ; Pungarabato, " shrub 4 m.," July 1934 (young fr.), *Hinton* 6272 ; *ibid.* Oct. 1934 (fr.), *Hinton* 6895 (type).

A specimen in the Kew herbarium, collected by Hartweg (No. 261) at Leon, may belong to this species. The material is, however, too young for accurate diagnosis.

No close affinity has been found for *B. coyucensis* ; the peculiar long indumentum is sufficient to separate it from all other species of the genus. In a very general way, it is of similar habit to *B. copallifera* (Sessé et Moc. ex DC.) Bullock, an identification of which is given on page 357.

Bursera diversifolia Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus diversifolia* (Rose) Rose, *l.c.* **12**, 279 (1909). *Elaphrium diversifolium* (Rose) Rose in N. Amer. Fl. **25**, 248 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1911).

This is known only from inadequate material. At once recalling *B. glabrifolia*, it differs in often having bipinnate leaves and thus stands in the same relation to that species as *B. elemifera* does to *B. penicillata*. Careful examination of all these species in the field is required in order to decide on the status of each. The question whether hybridisation between *B. bipinnata* and *B. glabrifolia* and *B. penicillata* takes place needs to be examined. Such hybrids could well account for the great variation observed in the three primary species, for the fact that the bipinnate condition of the leaves is rarely complete and often much reduced, and for the fact that both *B. elemifera* and *B. diversifolia* have been found only once. The last remark applies also to *B. collina*, which I have not seen, but which undoubtedly belongs to the same group. The only known specimen of *B. diversifolia* is :—

STATE OF CHIAPAS : Ocuilapa—Tuxtla, 500–1000 m. (approx.), Aug. 1895 (fr.), *Nelson* 3066 (U ; type).

Bursera elemifera (Royle) Baill. *Traité de Bot. Méd.* **952** (1884). *Elaphrium elemiferum* Royle, *Mat. Med.* **344** (1847), et *l.c.* ed. II. **390** (1853), non *Amyris elemifera* L. (1759) ; le Maout et Decne. *Traité de Bot.* **316** (1868), in obs. ; *l.c.* ed. Hook. f. **332** (1873 et 1876).—*Bursera mexicana* Engl. in DC. *Monogr.* **4**, **51** (1883), quoad spec. Finck.—*Bursera tenuifolia* Engl. ex O. Kuntze, *Rev. Gen.* **1**, **107** (1891).

A specimen in the Copenhagen herbarium (*Liebmann* 74) labelled "*Elaphrium elemiferum* Royle ex mss. Dr. Hanbury in herb. mus. Parisiensis" by L. Marchand led to a search for the name, which was not included in the *Index Kewensis*, with the result given above. Actually the Liebmann specimen is referable to *Bursera bipinnata*, but a plant which is evidently equal to Royle's type is in the Kew herbarium. It is the Finck specimen from Cordova, which Engler included in his *B. mexicana*. This plant was distributed by

Dr. Hanbury, and there are two good sheets at Kew, one at the Natural History Museum, and (by inference from Marchand's label in the Copenhagen herbarium) one at Paris.

Most of the leaves of the Kew specimen are simply pinnate, but a distinct tendency to the bipinnate condition can be traced. The Natural History Museum sheet shows that condition very well indeed. Apart from this character, the plant might be mistaken for *B. penicillata*, but the mature leaves are almost glabrous, and always lack the tufts of penicillate hairs at the "nodes" of the leaf rachis characteristic of that species. From *B. bipinnata* it can be distinguished by the much larger leaflets with more or less toothed margins and a strong tendency to acutely acuminate apices.

STATE OF OAXACA : Cordova, April* 1865 (fl. and young fr.), Finck s.n.

Bursera excelsa (H.B.K.) Engl. in DC. Monogr. 4, 57 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896). *Elaphrium excelsum* H. B. K. Nov. Gen. et Sp. 7, 30, t. 611 p.p. (1824); Rose in N. Amer. Fl. 25, 257 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923). *Terebinthus excelsa* (H.B.K.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. 10, 119 (1906).—*Bursera Palmeri* S. Wats. in Proc. Amer. Acad. 22, 402 (1887); Rose in Contr. U.S. Nat. Herb. 1, 313 (1895), et l.c. 5, 113 (1897); Riley in Kew Bull. 1923, 168. *Terebinthus Palmeri* (S. Wats.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium Palmeri* (S. Wats.) Rose in N. Amer. Fl. 25, 255 (1911).—*Elaphrium queretarensis* Rose in N. Amer. Fl. 25, 254 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923). *Bursera queretarensis* (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929).—*Bursera acutidens* Sprague et Riley in Kew Bull. 1923, 169.—*Bursera sphaerocarpa* Sprague et Riley, l.c. 170.

The type material of *Elaphrium excelsum* is in the Humboldt and Bonpland herbarium in Paris, but by the courtesy of the authorities there I have seen a photograph of the type specimen, and a small part of a leaf, detached and sent on loan to Kew. These, together with the other material cited below, have been sufficient to enable me to extend the synonymy given and suggested by Standley.

Fruiting material shows great variation in the size and shape of the seed, but transitional forms between extremes indicate that no reliance can be placed on this character. All, however, are more or less rounded, none showing acute angles or pointed apices; the variation observed refers more to relative length and breadth than to any distinct difference in form.

The amount of indumentum, and the texture of the leaves, varies considerably. This variation can, however, be co-related

* It is not clear whether "April" on the label indicates the month of collection or of distribution. Since 1865 is the year of collection, however, it seems impossible that the plant could have been collected earlier, sent to England and redistributed by that month.—A.A.B.

with differences in environment, age of the leaves, and vigour of the branches bearing them. The tothing of the wings of the leaf-rachis is not a character on which any reliance can be placed.

As indicated below, *B. excelsa* is very widely distributed, and like most widely spread species, varies considerably in almost all characters. It is closely allied to the almost equally variable *B. jorullensis*, from which it constantly differs in its comparatively smooth, not rugose, leaves.

STATE OF DURANGO: Near Durango, April–Nov. 1896 (fl.), Palmer 170, 308.

STATE OF JALISCO: Rio Blanco, in deep cañons, June–Oct. 1886 (fr.), Palmer 609 (type collection of *B. Palmeri*).

STATE OF COLIMA: Kerber 308 (B); Manzanillo, Dec. 1890 (fr.), Palmer 987 (type of *B. acutidens*).

STATE OF GUERRERO: Venta del Exido, *Humboldt and Bonpland* 3890 (P; type); near Acapulco, Oct.–March 1894–5 (fr.), Palmer 432 (type of *B. sphaerocarpa*).

STATE OF OAXACA: San Bartolo Yauhtepec, Jan. 1896, *Seler* 1648 (B).

STATE OF VERA CRUZ: Gualulu, Oct. 1842 (fr.), *Liebmann* 82 (C); Pochutla, Oct. 1842 (fr.), *Liebmann* 81 (C).

STATE OF QUERETARO: Near Queretaro, Aug. 1906 (fr.), Rose and Rose 11153 (U; type of *Elaphrium queretarens*).

Probably also in Guatemala (*Heyde and Lux* 3036, distributed as *B. Palmeri* S. Wats.).

Bursera fagaroides (H.B.K.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 48 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249, fig. 146 A (1896); T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, **3**, 120 (1891); O. Kuntze, Rev. Gen. 107 (1891). *Elaphrium fagaroides* H.B.K. Nov. Gen. et. Sp. **7**, 27, t. 611 (1824); Schlecht. in Linnaea, **17**, 245 (1843); Rose in N. Amer. Fl. **25**, 251 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923). *Amyris fagaroides* (H.B.K.) Spreng. Syst. Veg. **4**, Cur. Post. 148 (1827). *Terebinthus fagaroides* (H.B.K.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Bursera obovata* Turcz. in Bull. Soc. Nat. Mosc. **36**, 1, 614 (1863); Engl. in DC. Monogr. **4**, 59 (1883), sub. spp. dub. *Elaphrium obovatum* (Turcz.) Rose in N. Amer. Fl. **25**, 245 (1911).—*Bursera Schaffneri* S. Wats. in Proc. Amer. Acad. **22**, 469 (1887). *Terebinthus Schaffneri* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium Schaffneri* (S. Wats.) Rose in N. Amer. Fl. **25**, 245 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923).—*Bursera aptera* Ramirez, Dat. Mat. Med. Mex. **1**, 379, cum fig. (1894), et Estud. Hist. Nat. Mex. **119** (1904), et in An. Inst. Med. Nat. **2**, 16, t. 1 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus aptera* (Ramirez) Rose in Contr. U.S. Nat. Herb. **10**, 118 (1906). *Elaphrium apterum* (Ramirez) Rose in N. Amer. Fl. **25**, 249 (1911).—*Bursera Purpusii* T. S. Brandeg. in Zoe, **5**, 249 (1908). *Elaphrium Purpusii* (T. S. Brandeg.) Rose in

N. Amer. Fl. **25**, 249 (1911).—*Elaphrium Covillei* Rose in N. Amer. Fl. **25**, 250 (1911).—*Bursera odorata* T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, **2**, 138 (1889). *Terebinthus odorata* (T. S. Brandeg.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium odoratum* (T. S. Brandeg.) Rose in N. Amer. Fl. **25**, 250 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923), partim.—*Amyris ventricosa* La Ll., et *Amyris crenata* Willd.; ex Schlecht. in Linnaea, **17**, 245 (1843), in syn.

I have considered necessary some rearrangement of the plants included by Standley under the names *Elaphrium fagaroides* and *E. odoratum*, his conception of the latter being too wide, and of the former too narrow, to fit the increased representation of these plants at Kew. The fact that *E. odoratum* appears three times in Standley's key gives some idea of the range of variation allowed by him. The diagnostic character for *E. fagaroides*, "Leaflets finely crenate along almost the whole margin", I do not regard as sufficient; it merely separates extreme forms, one of which was figured in the original place of publication. The species as here understood varies from this to forms in which the leaflets are entire or nearly so; but always the leaf apex is obtuse or rounded, and the base cuneate. The leaf-rachis is either very narrowly winged or entirely devoid of wings. The very dark, reddish bark is characteristic.

It may be noted that Brandegee himself reduced his *B. odorata* to *B. fagaroides*.

STATE OF MEXICO: District of Temascaltepec; Bejucos, 610 m., July 1933, *Hinton* 4286; *ibid.* Aug. 1935 (fr.), *Hinton* 7744; Pungaranchó, July 1934 (young fr.), *Hinton* 6369; Naranjo, Feb. 1935 (fr.), *Hinton* 7394; Limones, June 1935 (fl.), *Hinton* 7839.

STATE OF SONORA: About six miles west of Torres, Feb. 1903 (fr.), *Coville* 1640 (U; type of *Elaphrium Covillei*).

STATE OF JALISCO: Rocky bluffs of Rio Grande de Santiago, near Guadalajara, Oct. 1889 (fr.), *Pringle* 2334; near Guadalajara, Sept. 1903 (fr.), *Rose and Painter* 7442 (C);

STATE OF MICHOACAN: District of Huetamo; Santa Cruz, Jan. 1934 (fr.), *Hinton* 5525; Mal Paso, Dec. 1934 (fr.), *Hinton* 7122; *ibid.* Jan. 1935 (fr.), *Hinton* 7272.

STATE OF GUERRERO: District of Coyuca; Coyuca, Nov. 1934 (fr.), *Hinton* 6899; *ibid.* June 1935, *Hinton* 7866; Tario, June 1935 (fl.), *Hinton* 7859 A; Cuahuilote, June 1935 (fl.), *Hinton* 7842; Pungarabato, June 1934 (fl.), *Hinton* 6126; *ibid.* Oct. 1934 (fr.), *Hinton* 6896; *ibid.* June 1935 (fl.), *Hinton* 7853; Pochote, June 1935 (fl.), *Hinton* 7878.

STATE OF MORELOS: Limestone hills near Jojutla, 100 m. (approx.), Oct. 1902 (fr.), *Pringle* 8700 (B).

STATE OF PUEBLA: Near Tehuacan, Aug. 1897 (fr.), *Pringle* 7502 (B); May 1842 (young fr.), *Liebmann* 25 (C); Tehuacan, May 1842, *Liebmann* 24 (C).

STATE OF VERA CRUZ: Barranca de Zacuapan, June 1906 (young fr.), *Purpus* 2045 (U; type collection of *B. Purpusii*).

STATE OF QUERETARO: Queretaro, *Bonpland* 4200 (B; "ex herb. Humboldt."; type collection).

STATE OF TAMAULIPAS: Tanmave, 620 m., Dec. 1930 (fr.), *Viereck* 822 (B).

STATE OF SAN LUIS POTOSI: "In montibus Morales," 1876 (fr.), *Schaffner* 90 (U; type of *B. Schaffneri*).

Without locality: *Viereck* 483 (B); *Uhde* 1183 (B); *Schaffner* s.n. (B); "Leon," 1839 (fl.), *Hartweg* 260.

Bursera filicifolia T. S. Brandeg. in Zoe, **5**, 248 (1908). *Elaphrium filicifolium* (T. S. Brandeg.) Rose in N. Amer. Fl. **25**, 254 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923).

Brandegees allies this with *B. laxiflora*, and from his description and notes, I suspect that it is no more than a form of that species. Only the fact that he says the leaves sometimes resemble those of the fern *Cheilanthes tomentosa* induces me to maintain it as a species.

LOWER CALIFORNIA: Rancho Colorado, *Brandegees* (type in Herb. Univ. Calif.; not seen).

Bursera Galeottiana Engl. in Engl. Bot. Jahrb. **1**, 43 (1881), et in DC. Monogr. **4**, 47 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 114 (1897). *Terebinthus Galeottiana* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium Galeottianum* (Engl.) Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923).

STATE OF OAXACA: Monte Alban, near Oaxaca, Nov. 1894 (fr.), *Pringle* 6071 (B, K);

STATE OF PUEBLA: Tlacuiloltepec, near San Luis Tultitlanapa, May 1909 (fl.), *Purpus* 4067 (B); Tehuacan, June 1840 (fl.), *Galeotti* 4004 (type in herb. Deless.), 4084 (K).

It seems probable that the number 4084 on the Kew sheet of the Galeotti specimen is an error for 4004; the two specimens are similar in every respect.

Bursera glabrifolia (H.B.K.) Engl. in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896), excl. syn. *Elaphrium glabrifolium* H.B.K. Nov. Gen. et Sp. **7**, 28 (1825); Schlecht. in Linnaea, **17**, 249 (1843); Rose in N. Amer. Fl. **25**, 251 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923), in obs.—*Amyris Linaloë* La. Ll. in Reg. Trim. **1**, 356 (1832).—*Elaphrium Aloëxylon* Schiede ex Schlecht. in Linnaea, **17**, 252 (1843); Rose in N. Amer. Fl. **25**, 255 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923); Martinez, Pl. Ut. Republ. Mex. **255**, cum fig. (1928). *Bursera Aloëxylon* (Schiede ex Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 52 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896); Martinez, Las Pl. Med. Mex. **411** (1933), cum bibliogr. *Terebinthus Aloëxylon* (Schiede ex Schlecht.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 118 (1906).—*Amyris Linaloë* La Ll. in La Naturaleza, **7**, Apénd. **73** (1885).—*Bursera*

Schiedeana Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 57 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus Schiedeana* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium Schiedeanaum* (Engl.) Rose in N. Amer. Fl. **25**, 256 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923).—*Bursera Nelsoni* Rose in Contr. U.S. Nat. Herb. **3**, 314 (1895), et l.c. **5**, 113 (1897). *Terebinthus Nelsoni* (Rose) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium Nelsoni* (Rose) Rose in N. Amer. Fl. **25**, 251 (1911).

The synonymy given here presents an entirely new conception of *Bursera glabrifolia*, a portion of the type of which I have examined, together with a photograph of the type specimen, which is in the Humboldt and Bonpland Herbarium in Paris. The material available for study, however, is still inadequate, and some slight transposition of the specimens cited, between this species and *B. penicillata* (q.v.) may still be necessary. This will not, however, have a very great effect on the conception of the two species as here understood.

The epithet "*glabrifolia*" is a misnomer. I have seen no specimen with glabrous leaves, and in most cases these are fairly densely pubescent. The upper surface of the leaves often becomes shiny in age, giving a false impression that the surface is glabrous.

STATE OF MEXICO: District of Temascaltepec; Temascaltepec, Oct. 1934 (fr.), *Hinton* 6790; Ypericones, May 1935 (fl.), *Hinton* 7832.

STATE OF PUEBLA: Atlixco, July–Aug. 1893, *Nelson* s.n. (U; type of *B. Nelsoni*).

STATE OF MICHOACAN: Ario, between Patzcuaro and Jorullo, *Humboldt and Bonpland* 4328 (P; type); Jorullo, "ad latera m. ign.," Dec. 1829, *Schiede* s.n. (B); *ibid.* Dec. 1829, *Schiede* 1025 (B), 1029 (B).

STATE OF OAXACA: May 1842, *Liebmann* 80 (C); *Galeotti* 4006 (B, K).

STATE OF MORELOS: Near Huantla (Cuantla?), Nov. 1836, *Schiede* s.n. (B; type of *B. Schiedeana*).

Without locality: *Uhde* 1181 (B).

Bursera grandifolia (Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 45 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Elaphrium grandifolium* Schlecht. in Linnaea, **17**, 249 (1843); Rose in N. Amer. Fl. **25**, 246 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923). *Terebinthus grandifolia* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Balsamodendrum Liebmannii* L. Marchand MS. in herb. mus. bot. Haun.—*Bursera cinerea* Engl. in DC. Monogr. **4**, 43 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus cinerea* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).

Elaphrium cinereum (Engl.) Rose in N. Amer. Fl. **25**, 245 (1911).—*Elaphrium occidentale* Rose in N. Amer. Fl. **25**, 246 (1911). *Bursera occidentalis* (Rose) Riley in Kew Bull. 1923, 168.

The pubescence of the drupes is a constant character in this species, but flowering material can be distinguished by a certain quality of the indumentum, which becomes apparent only after examination of a long series of specimens. The pubescent ovary serves also to distinguish it, but many of the specimens seen are entirely male, and the flowers contain only a rudimentary ovary which appears to be quite glabrous.

STATE OF MEXICO : District of Temascaltepec ; Bejucos, 610 m., June 1932 (fl.), *Hinton* 921 ; Anonas, 880 m., April 1933 (young fl.), *Hinton* 3804 ; *ibid.* Nov. 1933 (fr.), *Hinton* 5213 ; *ibid.* Oct. 1935 (fr.), *Hinton* 8533 ; Acatitlán, April 1935 (fl.), *Hinton* 7654, 7655, 7657 ; Cañitas, May 1935 (fl.), *Hinton* 7737 ; Palmar, May 1935 (fl.), *Hinton* 7773 ; Villa Neda, May 1935 (fl. and young fr.), *Hinton* 7802 ; Ixtapan, 1000 m., May 1933 (fl.), *Hinton* 3910 ; *ibid.* May 1935 (fl.), *Hinton* 7822 ; Limones, June 1935 (fl.), *Hinton* 7888. Rincón del Carmen, May 1933 (fl.), *Hinton* 3927 ; *ibid.* March 1935 (fr.), *Hinton* 7518 ; *ibid.* May 1935 (fl. and fr.), *Hinton* 7724 ; Vigas, April 1935 (fl.), *Hinton* 7662 ; Tejupilco, April 1935 (fl. and fr.), *Hinton* 7626 ;

STATE OF SINALOA : Mazatlan, 50 m., (fl.), *Ortega* 5204 ; *ibid.* 1924 (fl.), *Ortega* 978.

STATE OF JALISCO : Barranca of Guadalajara, June 1898 (fl.), *Pringle* 7614 (B).

STATE OF COLIMA : Dec. 1880 (fr.), *Kerber* 349 (B).

STATE OF MICHOACAN : District of Huetamo ; Mal Paso, Dec. 1934 (fr.), *Hinton* 7123 ; Huetamo—San Lucas, Feb. 1934 (fr.), *Hinton* 5705.

STATE OF GUERRERO : District of Coyuca ; Placeres, June 1934 (fl.), *Hinton* 6110 ; Pungarabato, Nov. 1934 (fr.), *Hinton* 6933 ; *ibid.* Jan. 1935 (fr.), *Hinton* 7242 ; Cutzamala, May 1935 (fl.), *Hinton* 7767 ; Tario, June 1935 (fl.), *Hinton* 7864 ; Quirio, June 1935 (fl. and young fr.), *Hinton* 7870.

STATE OF OAXACA : Tintetlan del Cancino, May 1842 (fl.), *Liebmänn* 69 (C) ; type of *Balsamodendrum Liebmannii* ; Valley of Cordova, (fl.), *Bourgeau* 2326 (B, type of *B. cinerea*).

STATE OF MORELOS : Cuernavaca, Sept. 1903 (fr.), *Rose and Painter* 6959 partim (C) ; *ibid.* lava fields, 1500 m., May 1898 (fl.), *Pringle* 6829 (K, B) ;

Without locality : " In reg. calid." (fr.), *Schiede* 1020 (B ; type).

Bursera heterophylla Engl. in DC. Monogr. **4**, 46 (1883) et in Engl. et Prantl, Nat. Pflanzenfam. **3**, **4**, 249 (1896). *Terebinthus heterophylla* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium heterophyllum* (Engl.) Rose in N. Amer. Fl. **25**, 247 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923).

This plant is very incompletely known, all the available material being young and inadequate. It is remarkable for the extremely rugose appearance of the flowering branches, due to the scars left by fallen leaves and inflorescences.

STATE OF MORELOS : Tlaquiltenango, *Ehrenberg* 1009 (B ; type).
Without locality : *Schiede* 1008 (B) ; *Ehrenberg* 1007 (B).

Bursera Hindsiana (*Benth.*) *Engl.* in DC. Monogr. 4, 58 (1883) ; et in *Engl. et Prantl. Nat. Pflanzenfam.* 3, 4, 251 (1896) ; T. S. Brandeg. in *Proc. Calif. Acad. Ser. 2*, 2, 138 (1889), et *l.c.* 3, 121 (1891). *Elaphrium Hindsianum* *Benth.* Bot. Voy. Sulph. 11, t. 8 (1844).—*Elaphrium rhoifolium* *Benth.* *l.c.* 10, t. 7 ; Rose in N. Amer. Fl. 25, 255 (1911). *Bursera Hindsiana* var. *rhoifolia* (*Benth.*) *Engl.* in DC. Monogr. 4, 59 (1883). *Terebinthus rhoifolia* (*Benth.*) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Bursera rhoifolia* (*Benth.*) I.M. Johnst. in *Proc. Calif. Acad. Sc. Ser. 4*, 12, 1058 (1924).—*Terebinthus MacDougalii* Rose in *Torreyia*, 6, 170 (1906), teste *Standl.* in Contr. U.S. Nat. Herb. 23, 552 (1923). *Elaphrium MacDougalii* (Rose) Rose in N. Amer. Fl. 25, 255 (1911).—*Elaphrium epinnatum* Rose in N. Amer. Fl. 25, 243 (1911), teste *Standl.* in Contr. U.S. Nat. Herb. 23, 552 (1923).—*Elaphrium Goldmani* Rose in N. Amer. Fl. 25, 256 (1911), teste *Standl.* in Contr. U.S. Nat. Herb. 23, 552 (1911).—*Bursera nesopola* I. M. Johnst. in *Proc. Calif. Acad. Sc. Ser. 4*, 20, 66 (1931).

Engler was the first to combine *Elaphrium Hindsianum* and *E. rhoifolium* in one species, and his choice of the epithet *Hindsiana* is accordingly binding under International Rules, Art. 56.

LOWER CALIFORNIA : Magdalena Bay, *Hinds* 1843 (type) ; *ibid.* *Hinds* 1841 (type of *Elaphrium rhoifolium*) ; *ibid.* May 1925, *Mason* 1901 ; Tortuga Is., "... tree or shrub 8-12 ft. high. Only species of tree on the island," May 1921, *Johnston* 3597 ; Playa Maria, July-Oct. 1896, *Anthony* 81 ; San José del Cabo, 1890, *Brandege* (not seen).

STATE OF SONORA : Hills near the Gulf of California, Aug. 1884, *Pringle* s.n.

Bursera Hintoni *Bullock* sp. nov. ; ramulis valde crassis, foliis magnis pinnatis, foliolis 6-10-jugatis magnis grosse subdupliciter crenato-serratis, rachi late serrato-alata, inflorescentiis inter eas specierum mexicanarum maximis distincta ; a *B. excelsa* (H.B.K.) *Engl.* ramis crassioribus, foliis inflorescentisque multo majoribus facile distinguenda.

Frutex vel arbor, 3-10 m. alta ; ramuli valde crassi, apicem versus 1-1.5 cm. diametro ; terminales laeves, internodiis elongatis, primum satis dense hirsuto-pilosi, demum glabri ; laterales internodiis valde abbreviatis, cicatricibus foliorum et inflorescentiarum delapsorum rugosi ; cortex laevis, glauco-ruber vel griseus. *Folia* imparipinnata, pro genere magna, apice ramulorum congesta, vel secus ramulos terminales elongatos alterna, petiolis usque ad

8 cm. longis basin versus vaginato-ampliat, interstitiis inter juga oblanceolato-alatis usque ad 4.5 cm. longis et 1.3 cm. latis marginibus serrato-crenatis, tota (petiolo incluso) usque ad 45 cm. longa, 20 cm. lata, juniora supra velutino-pubescentia, subtus tomentosa, adulta utraque pagina satis dense piloso-pubescentia (sed supra plus minusve nitida); foliola 6-10-jugata, lateralalia subsessilia, late lanceolata vel ovato-lanceolata, apice acute acuminata, basi rotundata, usque ad 12.5 cm. longa, 5.5 cm. lata, inferiora minora; foliolum terminale plus minusve rhomboideo-ovatum, apice gradatim acuminatum, basi cuneatum, usque ad 13 cm. longum et 7 cm. latum; omnia marginibus grosse subacute subdupliciter crenato-serrata, subtus nervis lateralibus (utrinsecus 16-22) venulisque prominenter reticulata. *Thyrsi* pro genere maximi, ex axillis perularum orti, satis dense molliterque pilosi, toti circiter 20 cm. longi et usque ad 5 cm. lati; pedunculi 4-9 cm. longi sed interdum breviores; bracteae lineares vel filiformes, usque ad 1 cm. longae sed saepe minores. *Flores masculi*; sepala lanceolata, subacuta, 2.5-5 mm. longa, leviter inaequalia, extra pilosa; petala oblonga, apice obtusa, circiter 4 mm. longa, extra leviter pilosa, sepalis longiora vel breviora; stamina 8, filamentis subulato-filiformibus 2 mm. longis, antheris oblongis 1 mm. longis; discus annularis, carnosus, leviter crenatus; ovarium parvum, abortivum. *Flores feminei*: petala atque sepala similia; stamina 8, parva, filamentis subulatis, antheris sterilibus; ovarium ovoideum, 2 mm. longum, glabrum, stylo conico 0.5 mm. longo, stigmate capitato leviter 3-lobo. *Flores hermaphroditi* non visi. *Drupae* glabrae, obovoideo-ellipsoideae, circiter 1.3 cm. longae et 8 mm. diametro, demum dehiscentes, valvis 2 prius quam seminibus delabentibus. *Semina* subobovoidea, unilateraliter compressa, 8-9 mm. longa, 6 mm. lata, plerumque arillo aurantiaco omnino induta, sed interdum apice testa nigra leviter exserta.

STATE OF MEXICO: District of Temascaltepec; Bejucos, 610 m., "shrub 4 m., resin used for incense," May 1933 (fl.), *Hinton* 3952; San Lucas, "shrub 3 m.," July 1933 (fl. and young fr.), *Hinton* 4298; Cañitas, "tree 6 m. high, range 600-1400 m., not found below Bejucos," Nov. 1934 (fr.), *Hinton* 6991 (type); *ibid.* "tree 8 m.," May 1935 (fl. and young fr.), *Hinton* 7774; Villa Neda, "10 m. high," May 1935 (fl.), *Hinton* 7794; Limones, "tree 6 m.," June 1935 (young fr.), *Hinton* 7889.

Only two kinds of flowers have been seen, distributed as follows:—

(a) Inflorescence predominantly ♀, with some ♂ towards the apex.

(b) Inflorescence entirely ♂.

It is not possible to say whether this applies to the whole plant or to individual inflorescences.

The sepals are very variable in length in both male and female flowers, varying from just over half as long to a little longer than the petals, which are fairly constant in length. The stamens in ♀ flowers are fairly well developed but the anthers are reduced and

obviously sterile. In ♂ flowers one or two anthers are often sterile. In all flowers the filaments are of unequal length; the differences are noticeable on dissection, but are scarcely measurable in the units in general use for taxonomic description. The affinities of *B. Hintoni* are undoubtedly with *B. excelsa* and its allies, from which it may be readily distinguished by the characters mentioned in the diagnosis above. The large inflorescence and infructescence is particularly noticeable, and also the relatively large number of drupes on each.

Bursera jorullensis (H.B.K.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 57 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251, fig. 146 N-O (1896), excl. syn. *Elaphrium jorullense* H.B.K. Nov. Gen. et Sp. **7**, 22, t. 612 (1825); Schlecht. in Linnaea, **17**, 628 (1843); Rose in N. Amer. Fl. **25**, 256 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923); Ramirez, Pl. Ut. Republ. Mex. 116, cum fig. (1928), et Las Pl. Med. Mex. 366 cum bibliogr. (1933). *Amyris jorullensis* (H.B.K.) Spreng. Syst. Veg. **4**, Cur. Post. 149 (1827). *Terebinthus jorullensis* (H.B.K.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Amyris rugosa* Willd. ex Schlecht. in Linnaea, **17**, 628 (1843), in syn.; Engl. in DC. Monogr. **4**, 58 (1883), in syn.—*Elaphrium lanuginosum* H.B.K. Nov. Gen. et Sp. **7**, 31 (1825); Schlecht. in Linnaea, **16**, 528 (1842); Rose in N. Amer. Fl. **25**, 256 (1911). *Amyris lanuginosa* (H.B.K.) Spreng. Syst. Veg. **4**, Cur. Post. 149 (1827). *Bursera lanuginosa* (H.B.K.) Engl. in DC. Monogr. **4**, 58 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 114 (1897). *Terebinthus lanuginosa* (H.B.K.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Elaphrium cuneatum* Schlecht. in Linnaea, **17**, 629 (1843); Rose in N. Amer. Fl. **25**, 257 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923). *Bursera cuneata* (Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 56 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus cuneata* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Bursera Palmeri* var. *glabrescens* S. Wats. in Proc. Amer. Acad. **25**, 145 (1890).—*Bursera glabrescens* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **3**, 313 (1895), et *l.c.* **5**, 113 (1897). *Terebinthus glabrescens* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium glabrescens* (S. Wats.) Rose in N. Amer. Fl. **25**, 256 (1911).

Specimens of this species collected at different seasons tend to present totally different aspects, mainly connected with the rugosity of the upper leaf-surface, and the amount of indumentum on the lower surface. Most of the reductions listed above are confirmations of Standley's opinions, but the reduction of *Elaphrium cuneatum* may perhaps give rise to some argument. It is possible to trace, however, an unbroken series of gradations in both the shape of the leaflet-base, and in the amount of indumentum, between the types of *Elaphrium jorullense* (base of leaflets rounded) and *Elaphrium*

cuneatum (base of leaflets cuneate). As this is the only character by which the two types can be distinguished with certainty, I have had to reduce Schlechtendal's later species.

STATE OF MEXICO : District of Temascaltepec ; Tejupilco, on a hill, "shrub 2 m.", Dec. 1934 (fr.), *Hinton* 7078 ; Volcán, on a hill, "2 m. high", Feb. 1935 (fr.), *Hinton* 7331 ; Guadalupe, Vallée de Mexico, June 1865 or 1866 (fr., fl.), *Bourgeau* 338 (K, B, C, P) ; *ibid.* Oct. 1867 (fr.), *Bilimek* 85 ; *ibid.* Sept. 1903, (fr.), *Rose and Painter* 7302 (C).

STATE OF JALISCO : Rio Grande de Santiago, near Guadalajara, on rocky bluffs, Oct. 1889 (fr.), *Pringle* 2335 (K, B) ; Guadalajara, on bluffs of the barranca, May 1891 (young fl.), *Pringle* 3707 (B) ; *ibid.* Sept. 1891 (fr.), *Pringle* 4032 (B).

STATE OF MICHOACAN : Ad radices montis Jorullo, *Schiede* 36 (locus classicus) ; *ibid.* *Schiede* s.n. (B) ; "San Salvador," 1908, *Gadow** s.n.

STATE OF GUERRERO : Near Balsas, 1905 (fr.), *Lemmon* 188 (K, B) ; near Taxmalac, *Seler* 4274 (B) ; Chilapa, Nov. 1929, *Schultze Jena* 242 (B).

STATE OF MORELOS : Hillsides near Cuernavaca, 1500 m., "a small tree," Nov. 1895 (fr.), *Pringle* 6208 (K, B) ; *ibid.* *Humboldt and Bonpland* 3989 (P) ; near Chapultepec, District of Cuernavaca, 1450 m., Dec. 1905, *Endlich* 1085 (B).

Without exact locality : *Arsène* 2736 (B) ; *Schmits* 710 (B. ex herb. Vindob.) ; *Ehrenberg* s.n. (B).

Bursera Karwinskii *Engl.* in DC. Monogr. **4**, 43 (1883), et in *Engl. et Prantl*, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus Karwinskii* (*Engl.*) *Rose* in Contr. U.S. Nat. Herb. **10**, 119 (1906) ; *Elaphrium Karwinskii* (*Engl.*) *Rose* in N. Amer. Fl. **25**, 248 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 546 (1923).

The portion of the type at Berlin is a mere scrap, but it is sufficient to show that this species is very near to *B. sessiliflora*. Its status as a species is uncertain.

STATE OF QUERETARO : Toliman, *Karwinski* (B ; type collection).

Bursera lancifolia (*Slecht.*) *Engl.* in *Engl. Bot. Jahrb.* **1**, 43 (1881), et in DC. Monogr. **4**, 42 (1883), et in *Engl. et Prantl*, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Elaphrium lancifolium* *Slecht.* in *Linnaea*, **17**, 247 (1843) ; *Rose* in N. Amer. Fl. **25**, 248 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 546 (1923). *Terebinthus lancifolia* (*Slecht.*) *W. F. Wight* ex *Rose* in Contr. U.S. Nat. Herb. **10**, 120 (1906).—*Bursera fragilis* *S. Wats.* in Proc. Amer. Acad. **21**, 422 (1886) ; *Rose* in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus fragilis* (*S. Wats.*) *Rose* in Contr. U.S. Nat. Herb. **10**,

* For an account of the vegetation and fauna, together with the history, of the Jorullo volcanoes, see Dr. Hans Gadow's book "Jorullo", published in 1930 by the University Press, Cambridge.

119 (1906). *Elaphrium fragile* (S. Wats.) Rose in N. Amer. Fl. **25**, 252 (1911).—*Bursera trijuga* Ramirez, Dat. Mat. Med. Mex. **1**, 380, cum fig. (1894), et in Anal. Inst. Med. Nac. **2**, 16 (1896), et Estud. Hist. Nat. **120** (1904); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus trijuga* (Ramirez) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium trijugum* (Ramirez) Rose in N. Amer. Fl. **25**, 248 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923); Martinez, Las Pl. Med. Mex. **371**, cum fig. (1934).—*Elaphrium Tecomaca* Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923), partim, non *Amyris Tecomaca* DC. (1825), nec *Bursera Tecomaca* (DC.) Standl. (1929), nec *Amyris sylvatica* Sessé et Moc. (1894) [non Jacq. (1763)].

The new identification of *Amyris Tecomaca* DC. is recorded on page 377; less discontinuous geographical distributions are thus obtained than by following Standley's identification of the Sessé and Mociño figure* on which it was based.

Both Rose and Standley suggest Vera Cruz as the type locality for Schiede's plants, one of which is the type, but there seems to be no reason why it should not have been collected from a point much further north.

STATE OF CHIHUAHUA: Hacienda San Miguel, near Batopilas, South-western Chihuahua, Aug.–Sept. 1885 (fr.), Palmer W (K; type collection of *B. fragilis*).

Without exact locality: "In reg. calid." (fr.), Schiede 998, 1021 (B); 1905 (fr.), Lemmon 191 (K, B).

Bursera laxiflora S. Wats. in Proc. Amer. Acad. **24**, 44 (1889); Rose in Contr. U.S. Nat. Herb. **1**, 313 (1895); Engl. in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897); T.S. Brandeg. in Zoe, **5**, 204 (1905); Riley in Kew Bull. 1923, 168; Loes. in Fedde, Repert. Sp. Nov. **12**, 224 (1924). *Terebinthus laxiflora* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium laxiflorum* (S. Wats.) Rose in N. Amer. Fl. **25**, 253 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923).—*Bursera concinna* Sandw. in Kew Bull. 1926, 434.

I have not seen *B. filicifolia* (q.v.) but from the description and Brandege's remarks, I strongly suspect that it is no more than a form of this plant. For the present, however, it is listed as a separate species.

B. laxiflora, especially the form formerly separated as *B. concinna*, recalls *B. stenophylla*, a plant with bipinnate leaves. As in that species, the seeds are only about half-covered by the fleshy aril-like pulp, and a probable hybrid origin of *B. stenophylla* is at once suggested.

STATE OF SONORA: Guaymas, Oct. 1887 (fr.), Palmer 280 (K, C, U; type collection).

STATE OF SINALOA: Agiabampo, 1890 (fr.), Palmer 797 (K, B); Ahome, Ortega 5567 (type of *B. concinna*).

* Alph. DC. Calq. Dess. t. 195 (1875).

Bursera longipedunculata (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Elaphrium longipedunculatum* Rose in N. Amer. Fl. **25**, 254 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923).

Apparently this is a distinct species, but the material seen is too inadequate for complete assurance that it is not a form of *Bursera graveolens* Triana et Planch., a widely spread and very variable South American species. It is at any rate distinct from any other Mexican species.

STATE OF OAXACA: Almoloyas, District of Cuicatlán, Sept. 1906 (fr.), *Rose and Rose* 11282 (U; type); *ibid.* June 1908 (fr.), *Conzatti* 2194 (B).

Standley gives Puebla also for the distribution of this plant, but I have seen no specimens from that state.

Bursera longipes (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus longipes* Rose in Contr. U.S. Nat. Herb. **10**, 120 (1906). *Elaphrium longipes* (Rose) Rose in N. Amer. Fl. **25**, 246 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923).

STATE OF OAXACA: near Cafetal Concordia, 400–650 m., April, 1933 (fr.), *Morton and Makrinius* 2501.

STATE OF MORELOS: Near Jojutla, May 1901 (fl. and young fr.), *Pringle* 8510 (U, B, C, K).

STATE OF PUEBLA: Matamoros, June 1899, *Rose and Hough* 4691 (U; type).

Another specimen at Kew, from either Michoacan or Guerrero, may belong here (*Langlassé* 1032).

Bursera microphylla A. Gray in Proc. Amer. Acad. **5**, 155 (1861) et *l.c.* **17**, 230 (1882); Engl. in DC. Monogr. **4**, 47 et 537 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); T.S. Brandeg. in Proc. Calif. Acad. Ser. 2, **3**, 121 (1891). *Terebinthus microphylla* (A. Gray) Rose in Contr. U.S. Nat. Herb. **10**, 120 (1906). *Elaphrium microphyllum* (A. Gray) Rose in N. Amer. Fl. **25**, 250 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923).—*Bursera morelensis* Ramirez in Anal. Inst. Med. Nac. Mex. **2**, 17, t. 3 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus morelensis* (Ramirez) Rose in Contr. U.S. Nat. Herb. **10**, 120 (1906). *Elaphrium morelense* (Ramirez) Rose in N. Amer. Fl. **25**, 250 (1911).—*Terebinthus multifolia* Rose in Contr. U.S. Nat. Herb. **10**, 120 (1906). *Elaphrium multifolium* (Rose) Rose in N. Amer. Fl. **25**, 250 (1911).

The leaves of *B. microphylla* (type) have fewer leaflets than the Pringle specimen of *B. morelensis*, and more than those of *B. arida* (q.v.). The exact status of each, and the characters which separate them from *B. Galeottiana* (q.v.), are not by any means clear. More material of each, and field observations on their variability, are required. The distribution suggests that *B. morelensis* and *B. microphylla* might be distinct, but I can find no character except the number of leaflets to separate them.

LOWER CALIFORNIA : Cape St. Lucas, Aug. 1859-Jan. 1860 (fr.), *Xantus* 21 ; Carmen Is., Nov. 1890 (fr.), *Palmer* 884 ; San Pedro Norasco Is., April 1921, *Johnston* 3128 ; Tiburon Is., July 1921 (fl.), *Johnston* 4273 ; San Estaban Is., April 1921, *Johnston* 3186 ; Coyote Bay, Concepcion Bay, June 1921, *Johnston* 4168 ; Magdalena Bay, May 1925 (fr.), *Mason* 1922.

STATE OF SONORA : Guaymas, 1887 (fl.), *Palmer* 163 ; Sierra Tulé, *Schott* (U ; not seen).

STATE OF MORELOS : Near Jojutla, Oct. 1902 (fr.), *Pringle* 8699 (K, B, C ; distrib. as *B. morelensis*)

Also in Arizona (*Pringle* s.n. in herb. Kew.).

Bursera multijuga Engl. in DC. Monogr. **4**, 42 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus multijuga* Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium multijugum* (Engl.) Rose in N. Amer. Fl. **25**, 248 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923). —*Bursera Pringlei* S. Wats. in Proc. Amer. Acad. **25**, 145 (1890) ; Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus Pringlei* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium Pringlei* (S. Wats.) Rose in N. Amer. Fl. **25**, 252 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923).

B. multijuga is closely allied to *B. confusa*, from which it may be distinguished by its more numerous, narrower leaflets, and longer inflorescences.

Examination of the type specimens of *B. multijuga* and *B. Pringlei* leaves no doubt that they are conspecific ; only lack of opportunity to examine the type can have led Watson to describe Pringle's plant as new. The wide separation of *B. multijuga* and *B. Pringlei* in both Rose's and Standley's keys to the species, is due to the too free use of the characters "rachis winged" and "rachis unwinged," which breaks down completely in many instances, and has led to the description of several invalid species. In a manuscript note, Engler notes that a sheet of the type collection of *B. Pringlei* in the Berlin herbarium is "=*B. multijuga*." Mr. Hinton has collected *B. multijuga* only once, in a much younger state than any other specimens I have seen.

STATE OF MEXICO : Salitre-Cañitas, District of Temascaltepec, 1300 m., on a dry hill, "shrub 4 m., flower white", May 1933, *Hinton* 3939.

STATE OF JALISCO : Rio Grande de Santiago, near Guadalajara, on rocky bluffs, Oct. 1889 (fr.), *Pringle* 2336 (K, B ; type collection of *B. Pringlei*) ; Barranca of Guadalajara, 1500 m., on rocky bluffs, July 1902 (fl.), *Pringle* 9705 (K, B) ; near Zapotlan, on lava beds, "a small tree", May 1893 (fl.), *Pringle* 4381 (K, B) ; barranca of Guadalajara, 1350 m., "15-20 feet", June 1898 (very young fr.), *Pringle* 7554 (B). Without locality, but probably in the State of Jalisco, "Central Mexico, summer of 1893 (fr.), *Pringle* 4372 (B, ex herb. A. Gray.).

STATE OF COLIMA : June 1880 (fl.), *Kerber* s.n. (B, type).

Further exploration will most probably considerably extend the distribution of this species, at least to Michoacan and Guerrero.

Bursera ovalifolia (*Schlecht.*) *Engl.* in *Engl. Bot. Jahrb.* **1**, 43 (1881), et in *DC. Monogr.* **4**, 40 (1883), et in *Engl. et Prantl, Nat. Pflanzenfam.* **3**, 4, 248 (1896); *Rose* in *Contr. U.S. Nat. Herb.* **1**, 313 (1895), et *l.c.* 314. *Elaphrium ovalifolium* *Schlecht.* in *Linnaea*, **17**, 248 (1843); *Rose* in *N. Amer. Fl.* **25**, 246 (1911). *Terebinthus ovalifolia* (*Schlecht.*) *Rose* in *Contr. U.S. Nat. Herb.* **10**, 121 (1906).—*Terebinthus acuminata* *Rose* in *Contr. U.S. Nat. Herb.* **12**, 278 (1909), non *Bursera acuminata* *Willd.* (1806). *Elaphrium acuminatum* (*Rose*) *Rose* in *N. Amer. Fl.* **25**, 247 (1911). —*Elaphrium Simaruba* *Standl.* in *Contr. U.S. Nat. Herb.* **23**, 547 (1923) partim, quoad syn., non *Pistacia Simaruba* *L.* (1753).

I have seen only a scrap of the type specimen of *B. ovalifolia* from Engler's herbarium at Berlin, but this, taken in conjunction with the published descriptions, leaves no doubt that the specimens cited below are conspecific. *B. ovalifolia* is distinguished from *B. Simaruba* (*L.*) *Sarg.* by only minor characters, of which the smaller fruits and somewhat emarginate apex of the acutely three-angled seeds are perhaps the most important; the seeds of *B. Simaruba* are acute, and the angles are rounded.

Mr. Hinton's number 7801 shows pedate division of the lowest leaflets. This has not, I believe, been observed previously.

STATE OF MEXICO : District of Temascaltepec; Las Vigas, 1080 m., in rocky places, June 1932 (fl.), *Hinton* 730; Volcán, 1530 m., on the edge of the crater, June 1933 (fl. and young fr.), *Hinton* 4084; Nanchititla, in oak woods, June 1934 (fl. and young fr.), *Hinton* 6141; Cañitas-Salitre, Jan. 1935 (fr.), *Hinton* 7299; Tejupilco, Dec. 1934 (fr.), *Hinton* 7140; *ibid.* Feb. 1935 (fr.), *Hinton* 7328; Acatitlán, Feb. 1935 (fr.), *Hinton* 7396; Ypericones, May 1935 (fl. and fr.), *Hinton* 7825; *ibid.* May 1935 (fl. and fr.) *Hinton* 7830, 7831; Villa Neda, May 1935 (fl. and fr.), *Hinton* 7801.*

STATE OF JALISCO : Near Chapala, Oct. 1903 (fr.), *Rose and Painter* 7656 (U; type of *Terebinthus acuminata*).

STATE OF COLIMA : March 1891 (fr.), *Palmer* 1388 (B).

STATE OF MICHOACAN : Rock fields near Coru Station, Oct. 1904 (fr.), *Pringle* 8838.

STATE OF GUERRERO : Near Acapulco, Oct.–March 1894–5 (fr.), *Palmer* 378.

STATE OF VERA CRUZ (?) : Consoquitla, Oct. 1841 (fr.), *Liebmann* 66 (C).

STATE OF TAMAULIPAS : Near Tampico, Jan. 1910 (fr.), *Palmer* 67.

Without exact locality : *Schiede* s.n. (B; type collection).

* The specimens with flowers and fruit consist of young shoots with flowers and young leaves, and older stems with fruit of the previous year, except where otherwise stated.

Bursera penicillata (Sessé et Moc. ex DC.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 52 (1883), partim, et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896) in syn. *Elaphrium penicillatum* Sessé et Moc. ex DC. in DC. Prodr. **1**, 724 (1824); Alph. DC. Calq. Dess. tt. 203, xxxC (1875); Rose in N. Amer. Fl. **25**, 253 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923). *Amyris penicillata* (Sessé et Moc. ex DC.) Spreng. Syst. Veg. **2**, 219 (1825). *Terebinthus penicillata* (Sessé et Moc. ex DC.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906).—*Bursera mexicana* Engl. in DC. Monogr. **4**, 51 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896), excl. spec. Finck. *Terebinthus mexicana* (Engl.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 120 (1906). *Elaphrium mexicanum* (Engl.) Rose in N. Amer. Fl. **25**, 253 (1911).—*Bursera Delpechiana* Poiss. ex Engl. in DC. Monogr. **4**, 53 (1883); Poiss. in Compt. Rend. Ass. France, Blois, "Sur le Linaloe", 1-7, t. x (1884)*; Engl. in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896); Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923), sub spp. dub. *Terebinthus Delpechiana* (Poiss. ex Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium Delpechianum* (Poiss. ex Engl.) Rose in N. Amer. Fl. **25**, 253 (1911).

Great variation in the amount of indumentum present on individual specimens of this species tends to obscure the fact that they are conspecific. *B. Delpechiana* was regarded as doubtful by Standley, but the type material in the Paris and Berlin herbaria leaves no doubt that it is equal to Sessé and Mocino's plant. Engler did not attempt to separate them in his keys to the species, and the descriptions given by him are not mutually exclusive; his separation of them is no doubt due to the fact that he wrongly included *Elaphrium glabrifolium* H.B.K. in his *Bursera penicillata*. The former is here maintained as a distinct species under the name *Bursera glabrifolia*.

The *Finck* specimen included by Engler in his *B. mexicana* is distinct, having bipinnate leaves, and is here identified as *Bursera elemifera* (Royle) Baill.

STATE OF MEXICO: District of Temascaltepec; Tejupilco, 1340 m., May 1932 (fl.), *Hinton* 683; Temascaltepec, June 1935 (fl.), *Hinton* 7697; Ixtapan, May 1935 (fl.), *Hinton* 7728; Vigas, May 1935, *Hinton* 7734.

STATE OF JALISCO: Huejotitan, May 1912 (fl.), *Diguet* s.n. (K, P, B).

STATE OF COLIMA: *Kerber* s.n. (B).

STATE OF MORELOS: Cuantla, 1879 (fl.), *Delpech* s.n. (P, B; type of *B. Delpechiana*).

STATE OF PUEBLA: Tlacuiloltepec, May 1909 (fl.), *Purpus* 4070 (B).

* I have seen only a repaginated separate of this paper, without the plate.—A.A.B.

Bursera rubra (Rose) Riley in Kew Bull. 1923, 168. *Terebinthus rubra* Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium rubrum* (Rose) Rose in N. Amer. Fl. **25**, 252 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923).

Rose states that "This species seems nearest *T. (Terebinthus) Pringlei* (= *B. multijuga*) but has shorter petioles and peduncle and much broader leaflets, etc."

STATE OF SINALOA: Near Colomas, July 1897 (fr.), Rose 1670 (U; type).

Bursera Schlechtendalii Engl. in DC. Monogr. **4**, 41 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 248 (1896). *Terebinthus Schlechtendalii* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium simplicifolium* Schlecht. in Linnaea, **16**, 532 (1842); Rose in N. Amer. Fl. **25**, 244 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923); non *Bursera simplicifolia* DC. (1825).—*Bursera Jonesii* Rose in Contr. U.S. Nat. Herb. **3**, 314 (1895), et l.c. **5**, 113 (1897), teste Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1911). *Terebinthus Jonesii* (Rose) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium Jonesii* (Rose) Rose in N. Amer. Fl. **25**, 244 (1911).

This is another species of uncertain status. It is very incompletely known, and the specimens I have seen are mere scraps.

If it belongs to the genus *Bursera*, it is very distinct, and without near allies.

STATE OF VERA CRUZ (?): S. Augustin, Oct. 1842 (fr.), Liebmann 65 (C).

Without exact locality: "in reg. calid." Schiede 1022 (B; type number).

Bursera sessiliflora Engl. in DC. Monogr. **4**, 55 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus sessiliflora* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium sessiliflorum* (Engl.) Rose in N. Amer. Fl. **25**, 254 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923), quoad nomen tantum.—*Bursera pannosa* L. Marchand ex Engl. in DC. Monogr. **4**, 54 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus pannosa* (L. Marchand ex Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium pannosum* (L. Marchand ex Engl.) Rose in N. Amer. Fl. **25**, 254 (1911); Standl.* in Contr. U.S. Nat. Herb. **23**, 550 (1923).—*Elaphrium brachypodium* Rose in N. Amer. Fl. **25**, 253 (1911).—*Elaphrium odoratum* Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923), partim, quoad syn. *Elaphrium brachypodium* Rose (1911), non *Bursera odorata* T. S. Brandeg. (1889).

Standley's reduction of *B. aspleniifolia* T. S. Brandeg. to this species is, I think, mistaken, and his notes and brief description

* Under this reference, Standley notes that he had not seen the plant, but he saw it in 1927, as the type specimen at Copenhagen is labelled over his signature in that year.

apply only to Brandegee's plant. As far as can be ascertained, *B. sessiliflora* has been known hitherto from the type collection only, no other specimens having been referred to it. *Elaphrium brachypodum* is certainly conspecific, and I am unable to find any difference of specific importance to separate *B. pannosa* from *B. sessiliflora*. In each case the type material is inadequate for thorough description, but the specimens collected by Mr. Hinton supply the deficiency. Engler placed his two species consecutively, and distinguished between them by means of leaf-characters which the new material shows to be valueless.

STATE OF MEXICO : District of Temascaltepec ; Ocotepec, Nov. 1934 (fr.), *Hinton* 7037 ; Tejupilco, May 1934 (fr.), *Hinton* 6065 ; *ibid.* Sept. 1934, *Hinton* 6566 ; *ibid.* April 1935 (fl.), *Hinton* 7634 ; *ibid.* April 1935 (fl.), *Hinton* 7635 ; Villa Neda, May 1935 (fl.), *Hinton* 7798 ; Ixtapan, 1000 m., April 1935 (fl.), *Hinton* 7629 ; *ibid.* April 1933 (fl.), *Hinton* 3733, 3735 ; Tejupilco—San José, Dec. 1934 (fr.), *Hinton* 7084 ; Ypericones, Feb. 1935 (fr.), *Hinton* 7340 ; *ibid.* May 1935 (fl. and young fr.), *Hinton* 7828 ; Volcán, Dec. 1934 (fr.), *Hinton* 7161 ; Pantoja, April 1935 (fl. and young fr.), *Hinton* 7645 ; Platanal, Oct. 1934 (fr.), *Hinton* 6741 ; San Lucas, April 1935 (fl.), *Hinton* 7649 ; *ibid.* April 1935 (fl.), *Hinton* 7651, 7652 ; Temascaltepec, May 1932 (fl.), *Hinton* 814 ; *ibid.* Oct. 1934 (fr.), *Hinton* 6787 ; *ibid.* May 1935 (fl.), *Hinton* 7682 ; *ibid.* June 1935 (fr.) *Hinton* 7705 ; Pungarancho, April 1933 (fl.), *Hinton* 3749 ; *ibid.* Oct. 1935 (fr.), *Hinton* 8571.

STATE OF JALISCO : Near Etzatlan, Oct. 1903 (fr.), *Rose and Painter* 7534 (U ; type of *Elaphrium brachypodum*).

STATE OF GUERRERO : Near Chilapa, Nov. 1929 (fr.), *Schultze Jena* 241 (B).

STATE OF VERA CRUZ : San Felipe, Mirador, May 1842 (fl.), *Liebmann* 78 (C ; type of *B. pannosa*).

Without exact locality : *Karwinski* s.n. (B, ex herb. Monac. ; type).

Bursera stenophylla *Sprague et Riley* in *Kew Bull.* 1923, 169.

This is a very close ally of *B. bipinnata*, only separated from it by means of leaf characters of doubtful value, the longer infructescence, and the smaller aril. It is, however, very different in general appearance, the leaflets recalling those of some forms of *B. laxiflora* (q.v.), thus suggesting that it is of hybrid origin.

STATE OF CHIHUAHUA : Hacienda San Miguel, Aug.-Nov. 1885 (fr.), *Palmer* 200 (type).

STATE OF SINALOA : Choix, Las Jicaras, 500 m., *Gonzalez* 894.

Without exact locality : Dec. 1904, *Endlich* 786 (B) ;

Bursera submoniliformis *Engl.* * in *DC. Monogr.* 4, 55 (1883), et in *Engl. et Prantl, Nat. Pflanzenfam.* 3, 4, 251 (1896) ; *Rose* in

* This epithet was first used in MS. by L. Marchand (under *Elaphrium*) in the Copenhagen herbarium, but its citation in the form *E. submoniliforme* (*Engl.*) L. Marchand ex *Rose*, would be somewhat misleading.—A.A.B.

Contr. U.S. Nat. Herb. **5**, 114 (1897). *Terebinthus submoniliformis* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium submoniliforme* (Engl.) Rose in N. Amer. Fl. **25**, 255 (1911); L. Marchand ex Engl. in DC. Monogr. **4**, 55 (1883), in syn.; Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923).

This species is known only from very young and imperfect material. It is probably allied to *B. velutina* (q.v.).

STATE OF OAXACA: Rio Vuellas, *Liebmann* (C, P, B; type collection).

Bursera subtrifoliata (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus subtrifoliata* Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium subtrifoliata* (Rose) Rose in N. Amer. Fl. **25**, 244 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 545 (1923).

As stated elsewhere, this is a close ally of *B. trimera*, but not, as suggested by Rose, of *B. Hindsiana*.

STATE OF JALISCO: West of Bolaños, Sept. 1897 (fr.), *Rose* 3014 (U; type).

Bursera Tecomaca (DC.) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Amyris Tecomaca* DC. in DC. Prodr. **2**, 82 (1825); Alph. DC. Calq. Dess. t. 195 (1875); Engl. in DC. Monogr. **4**, 59 (1883), sub spp. dub.; Rose in N. Amer. Fl. **25**, 257 (1911), sub spp. dub. *Elaphrium tecomaca* (DC.) Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923), quoad syn. typ.—*Bursera Kerberi* Engl. in DC. Monogr. **4**, 41 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); S. Wats. in Proc. Amer. Acad. **22**, 402 (1887); Urbina, Cat. Pl. Mex. 39 (1897). *Terebinthus Kerberi* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium Kerberi* (Engl.) Rose in N. Amer. Fl. **25**, 247 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923).—*Amyris sylvatica* Sessé et Moc. Fl. Mex. ed. 2, 93 (1894), non Jacq. (1763).

The inclusion by Standley of *Bursera fragilis* S. Wats. (see *B. lancifolia*, p. 369) as a synonym of his *Elaphrium tecomaca* (1923) suggests that, although citing only *Amyris Tecomaca* DC. as a synonym of his *Bursera Tecomaca* (1929), he was actually including under the combination specimens of Watson's species. I am unable to agree with Standley's identification of Sessé and Mociño's plant with the northern *B. fragilis*, and consider that, allowing for the pooriness of the figure, *B. Kerberi* fits it very well. Rose's suggestion that it is "near *E. graveolens* and *E. pilosum*", is misleading.

Bursera Tecomaca may be one of the species used for the production of Linaloe Oil; it is very resinous and may also be a source of Mexican Elemi.

Dr. Palmer's specimen carries the information, "A tree with few branches, about 16 ft. high and a foot in diameter, covered with loose bronzy papyraceous bark", whilst Mr. Hinton's labels state that it is a sweetly aromatic shrub or tree, 2–10 m. in height, bearing the general vernacular names "Copal" and "Copal Santo."

The specimens cited give a less discontinuous distribution than that given by Standley for *Elaphrium tecomaca*, and also indicate adjacent areas where the tree may be found.

STATE OF MEXICO : District of Temascaltepec ; Volcán, 1450 m., June 1932 (fl.), *Hinton* 738 ; Acatitlán, June 1934 (young fr.), *Hinton* 6192 ; Ixtapan, Dec. 1934 (fr.), *Hinton* 7158 ; Cañitas, Jan. 1935 (fr.), *Hinton* 7295 ; Cañitas—Salitre, Jan. 1935 (fr.), *Hinton* 7300 ; Cañitas, May 1935 (fl.), *Hinton* 7775 ; Vigas, May 1935 (fl.), *Hinton* 7815 ; Ixtapan, May 1935 (fl.), *Hinton* 7819.

STATE OF JALISCO : Tequila, Aug.—Sept. 1886 (fr.), *Palmer* 423 ; Tequila, Oct. 1893 (fr.), *Pringle* 4531 (K, B).

STATE OF COLIMA : Without exact locality or date (fr.), *Kerber* 310 (B ; type of *B. Kerberi*).

STATE OF GUERRERO : Mountains near Mazatlán, *Sessé and Mociño* (type, not seen).

Bursera trifoliolata *Bullock*, sp. nov. ; ramis ramosissimis, foliis dense pubescentibus trifoliolatis, seminibus acute trigonis distincta ; a *B. Hindsiana* (Benth.) Engl. foliis minoribus semper trifoliolatis marginibus minus dentatis, inflorescentiis brevius pedunculatis (saepe floribus fasciculatis) magis floriferis facile distinguenda.

Frutex 1–4 m. altus, vel *arbor* parva usque ad 6 m. alta, ramosissima, cortice pubescente (demum glabrato) rubro vel rubro-griseo, ramulis ultimis subspiniformibus 2–4 mm. diametro ; ramuli floriferi valde abbreviati ; ramuli steriles elongati, dense piloso-pubescentes, internodiis 1–2.5 cm. longis. *Folia* semper trifoliolata, apice ramulorum floriferorum congesta, vel secus ramulos steriles alterna ; petioli usque ad 2 cm. longi sed saepe multo breviores, dense piloso-pubescentes ; foliolum terminale obovatum vel rhomboideum vel oblanceolato-obovatum, usque ad 3.5 cm. longum et 1.5 cm. latum, apice rotundatum usque subacutum, basi cuneatum ; foliola lateralia minora, elliptica usque suborbicularia, utrinque plus minusve rotundata ; foliola omnia marginibus integra vel apicem versus plus minusve crenata, nervis lateralibus venulisque haud prominentibus, utraque pagina satis dense pilosa. *Flores* pauci vel numerosi, ex axillis foliorum juniorum fasciculati, vel in cymas paucifloras ebracteatas dispositi ; pedicelli 2–3 mm. longi, dense pubescentes. *Sepala* 3, ovata, circiter 1.5 mm. longa, interdum inaequalia, apice obtusa vel subacuta, extra dense pubescentia. *Petala* 3, oblonga, 5 mm. longa, apice obtusiuscula, leviter cucullata, sub anthesi marginibus valde incurva, extra leviter pilosa. *Stamina* 4–6, filamentis subulatis vix 2 mm. longis, antheris lineari-oblongis 1.5 mm. longis sed interdum minoribus et nonnunquam valde reductis et sterilibus. *Ovarium* non visum. *Discus* cupulari-annularis, satis profunde 4–6-crenatus. *Drupae* ambitu ovoideae apice acutae, acute trigonae, 7–8 mm. longae et circiter 6 mm. latae, pedicellis plus minusve abrupte reflexis, valvis 3 prius quam

378

seminibus delabentibus. *Semina* acute trigona, ambitu ovata, 5 mm. longa et 4.5 mm. lata, apice acuta, arillo flavido vel aurantiaco omnino induta.

STATE OF MEXICO : District of Temascaltepec ; Bejucos, 610 m., " a tree by the river ", June 1932 (fl.), *Hinton* 780 ; *ibid.* " shrub 4 m.", June 1935 (fl.), *Hinton* 7841 ; *ibid.* " from same tree as No. 7841 ", Oct. 1935 (fr.), *Hinton* 8529 ; Guayabal, 790 m., May 1933 (fl.), *Hinton* 3943 ; Calera, " tree 6 m. with milky sap ; poisonous ", July 1934, (fr.), *Hinton* 6340 (type) ; Linones, " shrub 1.5 m. ; sap milky, poisonous ", Jan. 1935 (fr.), *Hinton* 7238 ; Luvianos, " shrub 2.5 m., poisonous ", May 1935 (fl.), *Hinton* 7781.

STATE OF GUERRERO : District of Coyuca ; Pochote, " shrub 1.5 m.", June 1935 (fl.), *Hinton* 7879.

Vernacular names : Quincanchire(i) ; Copal.

A feature of this species is the constancy of the trifoliation of the leaves ; in some other species where trifoliate leaves occur, great variation in the number of leaflets occurs, as in *B. Hindsiana*, (q.v.) in which variation from 1-9 leaflets is recorded by Brandegee.

I have been unable to find a close affinity for *B. trifoliolata*, though in general appearance it recalls *B. Hindsiana* most strongly.

Bursera trimera *Bullock*, sp. nov. ; *B. subtrifoliatae* Rose affinis sed foliolis oblongis vel obovato-oblongeolatis longioribus, marginibus fere ad basin profundius serrato-crenatis, nervis lateralibus parallelis manifestis numerosioribus, petiolis plerumque longioribus satis distincta.

Frutex vel *arbor* parva, 1.5-6 m. alta, glaberrima ; truncus cortice papraceo exfoliato indutus ; rami ramulique pro rata graciles, 2-5 mm. diametro, striati, laterales abbreviati. *Folia* digitatim trifoliolata val rarius unifoliolata, apice ramulorum abbreviatorum congesta vel secus ramulos steriles alterna ; foliola terminalia subsessilia vel brevissime petiolulata, oblonga vel saepius obovato-oblongeolata, usque ad 3 cm. longa et 1.5 cm. lata (plerumque minora), apice semper rotundata, basi cuneata, marginibus serrato-crenatis, nervis lateralibus parallelis approximatis utrinsecus 10-14 cum costa manifestis ; foliola lateralia subsessilia, similia, sed plerumque paullo minora et saepe basin versus inaequilateralia hic etiam margine superiore integra ; petioli circiter 1 cm. longi. *Flores* masculi tantum visi, trimeri, ex axillis foliorum apice ramulorum solitarii vel 2-3 orti, saepe prius quam folia producta ; pedicelli obsoleti vel brevissimi vel usque ad 1 mm. longi. *Calyx* 3-partitus, sepalis late patentibus ovato-triangularibus obtusis vel subacutis vix 1 mm. longis. *Petala* latissime elliptica, apice rotundata, fere 2.5 mm. longa, 2 mm. lata, marginibus incurvis, rigida, adscendentia et paullo divergentia. *Stamina* 6, filamentis filiformibus vix 1 mm. longis, antheris oblongo-ellipsoideis 1 mm. longis vel paullo longioribus. *Discus* carnosus, 3-crenatus, plano-concavus. *Drupae* trigonae, ambitu oblique ovatae, apice subacutae, demum 3-valvatae. *Semina* solitaria, trigona, arillo pallido omnino induta.

STATE OF MEXICO: District of Temascaltepec; Calera, May 1935 (fl.), *Hinton* 7743.

STATE OF MICHOACAN: District of Huetamo; Mal Paso, May 1935 (fl.), *Hinton* 7765.

STATE OF GUERRERO: District of Coyuca; Santa Bárbara, June 1935 (fl.), *Hinton* 7590; Pungarabato, April 1934 (fl.), *Hinton* 5943, 5997; *ibid.* July 1934 (fr.), *Hinton* 6262 (type); *ibid.* June 1934 (fr.), *Hinton* 6934; *ibid.* Jan. 1935, *Hinton* 7245; *ibid.* May 1935 (fl.), *Hinton* 7759; *ibid.* June 1935 (fl., fr.), *Hinton* 7848.

Vernacular name: Copal.

Bursera trimera normally has trifoliolate leaves, but unifoliolate ones occur, usually on vigorous long vegetative shoots, and much more rarely on the short lateral fruiting branches. Flowers are normally produced before the leaves, in April and May, but one specimen (*Hinton* 7848), collected in June, shows flowers, fruit, and almost fully grown leaves. The type specimen (*Hinton* 6262), collected in July, shows mature leaves and almost mature fruit, whilst another (*Hinton* 6934), collected in November, shows leaves in the "sere and yellow" stage, and ripe dehiscent drupes. One other specimen (*Hinton* 7743) collected in May, shows comparatively young leaves and old flowers. With one exception, the remainder are flowering and leafless, the January specimen (*Hinton* 7272) having old fruits, either dehiscent or for some reason still quite firmly closed.

The nearest ally of *Bursera trimera* is undoubtedly *B. subtrifoliata* (Rose) Standl., though the latter is not by any means a close relative of *B. Hindsiana* Benth, as was suggested by Rose when publishing the original description (in Contr. U.S. Nat. Herb. 10, 122: 1906, under *Terebinthus*), since Bentham's species has tetramerous flowers and a paniculate inflorescence, in addition to a copious indumentum on leaves, young stems and inflorescence.

***Bursera velutina* Bullock**, sp. nov., foliis supra glauco-velutinis, infra albido-tomentosis, foliolis multijugatis distinctis; a *B. submoniliformi* Engl. petiolis brevioribus, foliolis numerosioribus grossius dentatis, alis interstitialibus distinctis, sepalis brevioribus facile distinguenda.

Frutex vel *arbor*, 2-6 m. alta; rami annotini teretes, crassi, circiter 1 cm. diametro, glabri, cortice laevi brunneo-rubro vel demum griseo; rami hornotini dense minute puberuli. *Folia* imparipinnata, ambitu oblongo-ob lanceolata, circiter 10 cm. longa, 3-4 cm. lata, petiolis usque ad 1 cm. longis sed saepissime brevioribus, interstitiis inter juga crenato-alatis usque ad 2.5 mm. latis, supra glauco-pubescentia, infra tomentosa albicantia; foliola 9-12-jugata, oblonga, usque ad 2 cm. longa et 7 mm. lata, marginibus satis grosse et obtuse serrata, apice subacuta vel rotundata, basi rotundata, brevissime petiolulata vel sessilia, supra velutino-tomentella et satis rugoso-reticulata, infra breviter albido-tomentosa et nervis venulisque prominentibus reticulata,

nervis lateralibus utrinsecus 8-10. *Flores* prius quam folia apparentes, in thyrsos angustos 2-3 cm. longos dense albido-pilosos dispositi; pedicelli graciles, usque ad 3.5 mm. longi, infra florem articulati; bracteae parvae, lineari-subulatae, deciduae. *Sepala* 4, oblongo-ovata, apice obtusa, 1.5 mm. longa, 1 mm. lata, extra pilosa. *Petala* 4, obovato-oblonga, apice obtusa, 3.5 mm. longa, 1.5 mm. lata, extra pilosa. *Stamina* (floris masculi) 8, filamentis filiformibus 1.25 mm. longis, antheris oblongis 1 mm. longis; stamina (floris feminei) abortiva, minora. *Ovarium* (floris feminei) globosum, 1.25 mm. diametro, glabrum; stylus crassus, conicus, 1 mm. longus; stigma capitatum, leviter 3-lobum. *Discus* carnosus, annularis, leviter crenatus. *Drupae* globosae, circiter 7 mm. diametro, apice brevissime apiculatae, leviter rugosae, brunneae, glabrae, demum valvis 2 dehiscentes. *Semina* globosa, luteo-alba, 6 mm. diametro.

STATE OF GUERRERO: District of Coyuca; Querendas, "tree 4 m., flower white", April 1934 (fl.), *Hinton* 5960; *ibid.* "6 m." May 1935 (fl.), *Hinton* 7760; Pungarabato, "shrub 3 m.", June 1934 (young fr.), *Hinton* 6124; *ibid.* "tree 4 m.; sweet smelling", July 1934 (fr.), *Hinton* 6261 (type); *ibid.* "2 m. high", Oct. 1934 (fr.), *Hinton* 6894; *ibid.* "2 m. high", May 1935 (young fr.), *Hinton* 7751; Cuajuilote, "shrub 2 m." May 1935 (fl.), *Hinton* 7747.

This is a very distinct species, characterised by the very short velvety indumentum on the upper surface of the leaves, which gives them a glaucous appearance, and the white tomentum of the lower surface. The short slender inflorescences, which appear before the leaves are also characteristic.

The relationship of *B. submoniliformis* to *B. velutina* is not clear, but of all the species I have seen it approaches nearest in general appearance to the plant described here. It is known to me only from the type collection (*Liebmann* 76, in the Copenhagen herbarium, from Oaxaca) and the material is in a very young condition, with imperfectly developed leaves and inflorescences. Engler's description (in DC. Monogr. 4, 55: 1883) states "foliis . . . 6-jugis", but the type specimen shows no leaves with more than eleven leaflets, and most of them have only seven leaflets. Standley (in Contr. U.S. Nat. Herb. 23, 551: 1923), gives some indication that he has seen other specimen(s), also from Oaxaca, in which the leaflets attain 3 cm. in length, as against Engler's maximum measurement of 1 cm. shown by the type specimen.

DOUBTFUL SPECIES AND SPECIES NOT SEEN.

Elaphrium subpubescens *Rose* in N. Amer. Fl. 25, 247 (1911). *Bursera gummifera* var. *pubescens* *Engl.* in DC. Monogr. 4, 40 (1883), non *Elaphrium pubescens* *Schlecht.* (1842).

This was founded on two specimens collected by Bourgeau (Nos. 2899 and 3131) in Vera Cruz, and preserved in the Paris Herbarium. Standley has included them in his *Elaphrium Simaruba*, and although it is doubtful whether they really belong to that West Indian species, it is impossible to say what their status is.

Terebinthus attenuata Rose in Contr. U.S. Nat. Herb. **12**, 278 (1909). *Elaphrium attenuatum* (Rose) Rose in N. Amer. Fl. **25**, 247 (1911).

Founded on a plant from Sinaloa, this also is included under *Elaphrium Simaruba* by Standley. The type material is inadequate for diagnostic purposes.

Terebinthus pilosa (Engl.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Bursera graveolens* var. *pilosa* Engl. in DC. Monogr. **4**, 49 (1883). *Elaphrium pilosum* (Engl.) Rose in N. Amer. Fl. **25**, 251 (1911).—*Elaphrium penicillatum* Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923) partim, non DC. (1824).

This was founded on a Kerber specimen from Colima, and I have been unable to separate it and some few other specimens from the South American *B. graveolens* Triana et Planch., with which Engler associated it. All the specimens seen, however, are too incomplete to provide the necessary diagnostic characters. It may be taken as certain that it is not equal to *B. penicillata* (DC.) Engl. as delimited by the present writer on p. 374.

Elaphrium ariense H.B.K. Nov. Gen. et Sp. **7**, 31 (1825).

Engler describes the type of this as "Specimen valde incompletum in herb. Mus. Paris." All authors since Kunth have regarded it as a doubtful species.

Elaphrium pubescens Schlecht. in Linnaea, **16**, 527 (1842); Rose in N. Amer. Fl. **25**, 251 (1911); Standl. in Contr. U.S. Nat. Herb. **25**, 550 (1923). *Terebinthus pubescens* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909).

Engler overlooked this plant; it seems likely that Standley's suggestion that it is introduced into Mexico is correct. It may be a form of *B. graveolens* Triana et Planch.

EXCLUDED SPECIES.

Bursera pubescens S. Wats. in Proc. Amer. Acad. **24**, 44 (1889), non *Elaphrium pubescens* Schlecht. (1842).—*Pachycormus discolor* (Benth.) Coville, Cent. Dict. rev. ed. 6708 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 671 (1923), cum syn. = *VEATCHIA DISCOLOR* (Benth.) T. S. Brandeg. var. *PUBESCENS* (S. Wats.) I. M. Johnst. in Proc. Calif. Acad. Sc. IV. **12**, 1079 (1924); Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929).

According to Johnston, who collected it at the type locality, Los Angeles Bay, and on Angel de la Guarda Island, this plant "is the most widely distributed of the varieties of *V. discolor* and is probably the best known." Watson described it as a species of *Bursera* from sterile material. The genus belongs to the Anacardiaceae, and the species was first described as *Schinus discolor* by Bentham in 1844.

Rhus Veatchiana Kellogg in Proc. Calif. Acad. **2**, 24 (1863) ; Engl. in DC. Monogr. **4**, (1883) sub sp. dub. *Burserae*.—*Pachycormus discolor* (Benth.) Coville, Cent. Dict. rev. ed. 6708 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 671 (1923), cum syn.

This plant, listed as a doubtful species of *Bursera* by Engler, is *VEATCHIA DISCOLOR* (Benth.) T. S. Brandeg. var. *VEATCHIANA* (Kellogg) I. M. Johnst. in Proc. Calif. Acad. Sc. IV. **12**, 1081 (1924), cum obs.

INDEX TO SPECIES AND SYNONYMS.

<i>Amyris</i>	<i>bicolor</i> Willd. ex Schlecht	<i>Bursera</i>	<i>biflora</i> (Rose) Standl., p. 354
„	<i>bipinnata</i> Sessé et Moc. ex DC.=B. <i>bipinnata</i>	„	<i>bipinnata</i> (Sessé et Moc. ex DC.) Engl., p. 355
„	<i>copallifera</i> (Sessé et Moc. ex DC.) Spreng.=B. <i>copallifera</i>	„	<i>cerasifolia</i> T. S. Brandeg., p. 356
„	<i>crenata</i> Willd. ex Schlecht. =B. <i>fagaroides</i>	„	<i>cinerea</i> Engl.=B. <i>grandifolia</i>
„	<i>fagaroides</i> (H.B.K.) Spreng. =B. <i>fagaroides</i>	„	<i>collina</i> T. S. Brandeg., p. 356
„	<i>jorullensis</i> (H.B.K.) Spreng. =B. <i>jorullensis</i>	„	<i>concinna</i> Sandw.=B. <i>laxiflora</i>
„	<i>lanuginosa</i> (H.B.K.) Spreng. =B. <i>jorullensis</i>	„	<i>confusa</i> (Rose) Bullock, p. 356
„	<i>Linaloë</i> La Ll.=B. <i>glabrifolia</i>	„	<i>copallifera</i> (Sessé et Moc. ex DC.) Bullock, p. 357
„	<i>Linanoë</i> La Ll.=B. <i>glabrifolia</i>	„	<i>coyucensis</i> Bullock, p. 358
„	<i>penicillata</i> (Sessé et Moc. ex DC.) Spreng.=B. <i>penicillata</i>	„	<i>cuneata</i> (Schlecht.) Engl.=B. <i>jorullensis</i>
„	<i>rugosa</i> Willd. ex Schlecht. =B. <i>jorullensis</i>	„	<i>Delpechiana</i> Poiss. ex Engl. =B. <i>penicillata</i>
„	<i>sylvatica</i> Sessé et Moc.=B. <i>Tecomaca</i>	„	<i>diversifolia</i> Rose, p. 359
„	<i>Tecomaca</i> DC.=B. <i>Tecomaca</i>	„	<i>elemifera</i> (Royle) Baill., p. 359
„	<i>ventricosa</i> La Ll. ex Schlecht =B. <i>fagaroides</i>	„	<i>excelsa</i> (H.B.K.) Engl., p. 360
<i>Balsamodendrum</i>	<i>Liebmannii</i> L. Marchand MS.=B. <i>grandifolia</i>	„	<i>fagaroides</i> (H.B.K.) Engl., p. 361
<i>Bursera</i>	<i>acutidens</i> Sprague et Riley =B. <i>excelsa</i>	„	<i>filicifolia</i> T. S. Brandeg., p. 363
„	<i>Aloëxylon</i> (Schiede ex Schlecht.) Engl. =B. <i>glabrifolia</i>	„	<i>fragilis</i> S. Wats.=B. <i>lanceifolia</i>
„	<i>aptera</i> Ramirez=B. <i>fagaroides</i>	„	<i>Galeottiana</i> Engl., p. 363
„	<i>arborea</i> (Rose) Bullock, p. 353	„	<i>glabrescens</i> (S. Wats.) Rose =B. <i>jorullensis</i>
„	<i>arida</i> (Rose) Standl., p. 353	„	<i>glabrifolia</i> (H.B.K.) Engl., p. 363
„	<i>aspleniifolia</i> T. S. Brandeg. p. 353	„	<i>gracilis</i> Engl.=B. <i>bipinnata</i>
„	<i>bicolor</i> (Willd. ex Schlecht.) Engl., p. 354	„	<i>grandifolia</i> (Schlecht.) Engl., p. 364
		„	<i>graveolens</i> var. <i>pilosa</i> Engl. ; sp. dub., p. 382
		„	<i>gummifera</i> var. <i>pubescens</i> Engl. ; sp. dub., p. 381
		„	<i>heterophylla</i> Engl., p. 365
		„	<i>Hindsiana</i> (Benth.) Engl., p. 366

Bursera Hintoni *Bullock*, p. 366
 „ *Jonesii* Rose=B. Schlechtendalii
 „ **zorullensis** (*H.B.K.*) *Engl.*, p. 368
 „ **Karwinski** (*Engl.*) *Rose*, p. 369
 „ *Kerberi* *Engl.*=B. *Tecomaca lancifolia* (*Schlecht.*) *Engl.*, p. 369
 „ *lanuginosa* (*H.B.K.*) *Engl.* =B. *zorullensis*
 „ **laxiflora** *S. Wats.*, p. 370
 „ *lonchophylla* *Sprague et Riley* =B. *confusa*
 „ **longipedunculata** (*Rose*) *Standl.*, p. 371
 „ **longipes** (*Rose*) *Standl.*, p. 371
 „ *mexicana* *Engl.* p.p.=B. *elemifera*
 „ *mexicana* *Engl.* p.p.=B. *penicillata*
 „ **microphylla** *A. Gray*, p. 371
 „ *morelensis* *Ramirez*=B. *microphylla*
 „ **multijuga** *Engl.*, p. 372
 „ *Nelsoni* *Rose*=B. *glabrifolia*
 „ *nesopola* *I. M. Johnst.*=B. *Hindsiana*
 „ *obovata* *Turcz.*=B. *fagaroides*
 „ *occidentalis* (*Rose*) *Riley*=B. *grandifolia*
 „ *odorata* *T. S. Brandeg.*=B. *fagaroides*
 „ **ovalifolia** (*Schlecht.*) *Engl.*, p. 373
 „ *Palmeri* *S. Wats.*=B. *excelsa*
 „ *pannosa* *L. Marchand ex Engl.*=B. *sessiliflora*
 „ **penicillata** (*Sessé et Moc. ex DC.*) *Engl.*, p. 374
 „ *Pringlei* *S. Wats.*=B. *multijuga*
 „ *pubescens* *S. Wats.*=*Veatchia discolor* var. *pubescens*
 „ *Purpusii* *T. S. Brandeg.*=B. *fagaroides*
 „ *queretarensis* (*Rose*) *Standl.* =B. *excelsa*
 „ *rhoifolia* (*Benth.*) *I.M. Johnst.* =B. *Hindsiana*
 „ **rubra** (*Rose*) *Riley*, p. 375
 „ *Schaffneri* *S. Wats.*=B. *fagaroides*
 „ *Schiedeana* *Engl.*=B. *glabrifolia*
 „ **Schlechtendalii** *Engl.*, p. 375
 „ **sessiliflora** *Engl.*, p. 375

Bursera sphaerocarpa *Sprague et Riley*=B. *excelsa*
 „ **stenophylla** *Sprague et Riley*, p. 376
 „ **submoniliformis** *Engl.*, p. 376
 „ **subtrifoliata** (*Rose*) *Standl.*, p. 377
 „ **Tecomaca** (*DC.*) *Standl.*, p. 377
 „ *tenuifolia* *Engl. ex O. Kuntze* =B. *elemifera*
 „ *tenuifolia* *Rose*=B. *confusa*
 „ **trifoliolata** *Bullock*, p. 378
 „ *trijuga* *Ramirez*=B. *lancifolia*
 „ **trimera** *Bullock*, p. 379
 „ **velutina** *Bullock*, p. 380

Elaphrium acuminatum (*Rose*) *Rose* =B. *ovalifolia*
 „ *Aloëxylon* *Schiede ex Schlecht*=B. *glabrifolia*
 „ *apterum* (*Ramirez*) *Rose* =B. *fagaroides*
 „ *arborescens* (*Rose*) *Rose*=B. *arborescens*
 „ *aridum* (*Rose*) *Rose*=B. *arida*
 „ *ariense* *H.B.K.*; sp. dub., p. 382
 „ *aspleniifolium* (*T. S. Brandeg.*) *Rose*=B. *aspleniifolia*
 „ *attenuatum* (*Rose*) *Rose*; sp. dub., p. 382
 „ *bicolor* *Willd. ex Schlecht.* =B. *bicolor*
 „ *biflorum* (*Rose*) *Rose*=B. *biflora*
 „ *bipinnatum* (*Sessé et Moc. ex DC.*) *Schlecht.*=B. *bipinnata*
 „ *brachypodum* *Rose* =B. *sessiliflora*
 „ *cerasifolium* (*T. S. Brandeg.*) *Rose*=B. *cerasifolia*
 „ *cinereum* (*Engl.*) *Rose*=B. *grandifolia*
 „ *collinum* (*T. S. Brandeg.*) *Rose*=B. *collina*
 „ *confusum* *Rose*=B. *confusa*
 „ *copalliferum* (*Sessé et Moc. ex DC.*)=B. *copallifera*
 „ *Covillei* *Rose*=B. *fagaroides*
 „ *cuneatum* *Schlecht.* =B. *zorullensis*

Elaphrium Delpechianum (Poiss. ex Engl.) Rose=B. penicillata
 „ *diversifolium* (Rose) Rose=B. diversifolia
 „ *elemiferum* Royle=B. elemifera
 „ *epinnatum* Rose=B. Hind-siana
 „ *excelsum* H.B.K.=B. excelsa
 „ *fagaroides* H.B.K. = B. fagaroides
 „ *filicifolium* (T. S. Brandeg.) Rose=B. filicifolia
 „ *fragile* (S. Wats.) Rose=B. lancifolia
 „ *Galeottianum* (Engl.) Rose=B. Galeottiana
 „ *glabrescens* (S. Wats.) Rose=B. jorullensis
 „ *glabrifolium* Schlecht.=B. glabrifolia
 „ *Goldmani* Rose=B. Hind-siana
 „ *gracile* (Engl.) Rose=B. bipinnata
 „ *grandifolium* Schlecht.=B. grandifolia
 „ *heterophyllum* (Engl.) Rose=B. heterophylla
 „ *Hindsianum* Benth.=B. Hindsiana
 „ *Jonesii* (Rose) Rose=B. Schlechtendalii
 „ *jorullense* H.B.K.=B. jorullensis
 „ *Karwinskii* (Engl.) Rose=B. Karwinskii
 „ *Kerberi* (Engl.) Rose=B. Tecomaca
 „ *lancifolium* Schlecht.=B. lancifolia
 „ *lanuginosum* H.B.K.=B. jorullensis
 „ *laxiflorum* (S. Wats.) Rose=B. laxiflora
 „ *longipedunculatum* Rose=B. longipedunculata
 „ *longipes* (Rose) Rose=B. longipes
 „ *MacDougalii* (Rose) Rose=B. Hindsiana
 „ *mexicanum* (Engl.) Rose=B. penicillata
 „ *microphyllum* (A. Gray) Rose=B. microphylla
 „ *morelense* (Ramirez) Rose=B. microphylla

Elaphrium multifolium (Rose) Rose=B. microphylla
 „ *multijugum* (Engl.) Rose=B. multijuga
 „ *Nelsoni* (Rose) Rose=B. glabrifolia
 „ *obovatum* (Turcz.) Rose=B. fagaroides
 „ *occidentale* Rose=B. grandifolia
 „ *odoratum* (T. S. Brandeg.) Rose=B. fagaroides
 „ *odoratum* Standl. p.p.=B. confusa
 „ *odoratum* Standl. p.p.=B. fagaroides
 „ *odoratum* Standl. p.p.=B. sessiliflora
 „ *ovalifolium* Schlecht.=B. ovalifolia
 „ *Palmeri* (S. Wats.) Rose=B. excelsa
 „ *pannosum* (L. Marchand ex Engl.) Rose=B. sessiliflora
 „ *penicillatum* Sessé et Moc. ex DC.=B. penicillata
 „ *pilosum* (Engl.) Rose; sp. dub., p. 382
 „ *Pringlei* (S. Wats.) Rose=B. multijuga
 „ *pubescens* Schlecht.; sp. dub., p. 382
 „ *Purpusii* (T. S. Brandeg.) Rose=B. fagaroides
 „ *queretarensense* Rose=B. excelsa
 „ *rhoifolium* Benth. = B. Hindsiana
 „ *rubrum* (Rose) Rose=B. rubra
 „ *Schaffneri* (S. Wats.) Rose=B. fagaroides
 „ *Schiedeanum* (Engl.) Rose=B. glabrifolia
 „ *sessiliflorum* (Engl.) Rose=B. sessiliflora
 „ *sessiliflorum* Standl. p.p.=B. aspleniifolia
 „ *Simaruba* Standl. p.p.=B. arborea
 „ *Simaruba* Standl. p.p.=B. ovalifolia
 „ *simplicifolium* Schlecht.=B. Schlechtendalii
 „ *submoniliforme* (Engl.) Rose=B. submoniliformis
 „ *subpubescens* Rose; sp. dub., p. 381

<i>Elaphrium subtrifoliata</i> (Rose) Rose	<i>Terebinthus heterophylla</i> (Engl.) Rose
= <i>B. subtrifoliata</i>	= <i>B. heterophylla</i>
,, <i>Tecomaca</i> (DC.) Standl.	,, <i>Jonesii</i> (Rose) Rose = <i>B.</i>
= <i>B. Tecomaca</i>	<i>Schlechtendalii</i>
,, <i>Tecomaca</i> Standl. p.p. = <i>B.</i>	,, <i>jurullensis</i> (H.B.K.) W.F.
<i>lancifolia</i>	Wight ex Rose = <i>B.</i>
,, <i>tenuifolium</i> (Rose) Rose	<i>jurullensis</i>
= <i>B. confusa</i>	,, <i>Karwinskii</i> (Engl.) Rose
,, <i>trijugum</i> (Ramirez) Rose	= <i>B. Karwinskii</i>
= <i>B. lancifolia</i>	,, <i>Kerberi</i> (Engl.) Rose = <i>B.</i>
	<i>Tecomaca</i>
<i>Rhus filicina</i> Sessé et Moc. ex	,, <i>lancifolia</i> (Schlecht.) W.F.
DC. = <i>B. bipinnata</i>	Wight ex Rose = <i>B.</i>
,, <i>Veatchiana</i> Kellogg =	<i>lancifolia</i>
<i>Veatchia discolor</i> var.	,, <i>lanuginosa</i> (H.B.K.) Rose
<i>Veatchiana</i>	= <i>B. jurullensis</i>
	,, <i>laxiflora</i> (S. Wats.) Rose
<i>Terebinthus acuminata</i> Rose = <i>B. ovali-</i>	= <i>B. laxiflora</i>
<i>folia</i>	,, <i>longipes</i> Rose = <i>B. longipes</i>
,, <i>Aloëxylon</i> (Schiede ex	,, <i>MacDougalii</i> Rose = <i>B.</i>
Schlecht.) W.F. Wight	<i>Hindsiana</i>
ex Rose = <i>B. glabrifolia</i>	,, <i>mexicana</i> (Engl.) W. F.
,, <i>aptera</i> (Ramirez) Rose =	Wight ex Rose = <i>B.</i>
<i>B. fagaroides</i>	<i>penicillata</i>
,, <i>arborea</i> Rose = <i>B. arborea</i>	,, <i>microphylla</i> (A. Gray) Rose
,, <i>arida</i> Rose = <i>B. arida</i>	= <i>B. microphylla</i>
,, <i>attenuata</i> Rose; sp. dub.,	,, <i>morelensis</i> (Ramirez) Rose
p. 382.	= <i>B. microphylla</i>
,, <i>bicolor</i> (Willd. ex Schlecht.)	,, <i>multifolia</i> Rose = <i>B. micro-</i>
Rose = <i>Bursera bicolor</i>	<i>phylla</i>
,, <i>biflora</i> Rose = <i>B. biflora</i>	,, <i>multijuga</i> (Engl.) Rose =
,, <i>bipinnata</i> (Sessé et Moc.	<i>B. multijuga</i>
ex DC.) W.F. Wight ex	,, <i>Nelsoni</i> (Rose) Rose = <i>B.</i>
Rose = <i>B. bipinnata</i>	<i>glabrifolia</i>
,, <i>cerasifolia</i> (T. S. Brandeg.)	,, <i>odorata</i> (T. S. Brandeg.)
Rose = <i>B. cerasifolia</i>	Rose = <i>B. fagaroides</i>
,, <i>cinerea</i> (Engl.) Rose = <i>B.</i>	,, <i>ovalifolia</i> (Schlecht.) Rose
<i>grandifolia</i>	= <i>B. ovalifolia</i>
,, <i>cuneata</i> (Schlecht.) Rose	,, <i>Palmeri</i> (S. Wats.) Rose =
= <i>B. jurullensis</i>	<i>B. excelsa</i>
,, <i>Delpechiana</i> (Poiss. ex	,, <i>pannosa</i> (L. Marchand ex
Engl.) Rose = <i>B. penicil-</i>	Engl.) Rose = <i>B. sessili-</i>
<i>lata</i>	<i>flora</i>
,, <i>diversifolia</i> (Rose) Rose	,, <i>penicillata</i> (Sessé et Moc.
= <i>B. diversifolia</i>	ex DC.) Rose = <i>B. peni-</i>
,, <i>excelsa</i> (H.B.K.) W.F.	<i>cillata</i>
Wight ex Rose = <i>B. ex-</i>	,, <i>pilosa</i> Rose; sp. dub.,
<i>celsa</i>	p. 382.
,, <i>fagaroides</i> (H.B.K.) Rose	,, <i>Pringlei</i> (S. Wats.) Rose
= <i>B. fagaroides</i>	= <i>B. multijuga</i>
,, <i>fragilis</i> (S. Wats.) Rose	,, <i>pubescens</i> (Engl.) Rose;
= <i>B. lancifolia</i>	sp. dub., p. 382
,, <i>Galeottiana</i> (Engl.) Rose	,, <i>rhoifolia</i> (Benth.) Rose
= <i>B. Galeottiana</i>	= <i>B. Hindsiana</i>
,, <i>glabrescens</i> (S. Wats.) Rose	,, <i>rubra</i> Rose = <i>B. rubra</i>
= <i>B. jurullensis</i>	,, <i>Schaffneri</i> (S. Wats.) Rose
,, <i>gracilis</i> (Engl.) Rose = <i>B.</i>	= <i>B. fagaroides</i>
<i>bipinnata</i>	,, <i>Schiedeana</i> (Engl.) Rose
,, <i>grandifolia</i> (Schlecht.)	= <i>B. glabrifolia</i>
Rose = <i>B. grandifolia</i>	

<i>Terebinthus Schlechtendalii</i> (Engl.)	<i>Terebinthus trijuga</i> (Ramirez) Rose=
Rose=B. <i>simplicifolia</i>	B. <i>lancifolia</i>
„ <i>sessiliflora</i> (Engl.) Rose=	
B. <i>sessiliflora</i>	
„ <i>submoniliformis</i> (Engl.)	<i>Veatchia discolor</i> var. <i>pubescens</i>
Rose = B. <i>submoniliformis</i>	(S. Wats.) I.M. Johnst. ;
„ <i>subtrifoliata</i> Rose=B. <i>subtrifoliata</i>	sp. excl., p. 382
„ <i>tenuifolia</i> (Rose) Rose=	„ <i>discolor</i> var. <i>Veatchiana</i>
B. <i>confusa</i>	(Kellogg) I.M. Johnst. ;
	sp. excl., p. 383

XXXVI — CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXVIII.*

SPECIES NOVAE VEL MINUS COGNITAE MEXICANAE HINTONIANAE.
—A. A. BULLOCK.

Descriptions of some of Mr. Hinton's Mexican plants have already appeared in this series (K.B. 1936, 1), and in Hooker's *Icones Plantarum*, in addition to an account, based largely on his collections, of the genus *Bursera* (in this number). The following new species and new combinations, together with notes on some other plants, have been worked out while naming this important collection.

Most of the specimens are being collected in a relatively small area, namely, the District of Temascaltepec, situated in the south-western corner of Mexico State and bordering on Michoacan and Guerrero, the adjoining areas in these latter states being worked over to a lesser extent. The flora of the area is extremely rich in species, and the altitude range is from 610 m. at Bejucos to 3450 m. at Las Raices.

The collection now covers over 9000 numbers and is of high scientific value, owing to its being based on intensive exploration of a restricted area.

RANUNCULACEAE.

***Delphinium bicornutum* Hemsl.** Diagn. Pl. Nov. pars alt. 17 (1879), et Biol. Centr.-Amer. 1, 9 (1879) ; Huth in Engl. Bot. Jahrb. 20, 453 (1895) descr. emend., incl. var. *Hemsleyi* Huth, l.c.

STATE OF MEXICO. District of Temascaltepec : Temascaltepec, 1750 m., on a rocky hill, Oct. 1932, *Hinton* 2063 ; *ibid.*, up to 1.5 m. high, Sept. 1934, *Hinton* 6579 ; Peñon-Tule, 1.25 m. high, Sept. 1935, *Hinton* 8293.

The following specimens are also deposited at Kew :— State of Oaxaca, *Ghiesbreght* s.n. (type) ; State of Michoacan, *Arsène* 5763 ; State of Jalisco, *Pringle*, 3862, 11368 ; State of Morelos, *Pringle* 8259.

The bifid spur from which Hemsley took the name of this species is probably a slight abnormality, for other specimens including those collected by Mr. Hinton, which appear to be otherwise identical

* Continued from preceding article.

have an entire or almost entire spur. A further variable character, also considered to be of specific value by Hemsley, is the hairiness of the stamens. In the type, the stamens are quite definitely pubescent, but among the other specimens cited above, there is a distinct gradation between pubescent stamens and glabrous ones. Huth recognised the variability of the spur character, having examined the Ghiesbreght specimens in the Delessert and Paris herbaria, in addition to the type at Kew; he made the variety *Hemsleyi* for the form with a bifid spur. The present writer does not consider the point to be of sufficient importance to warrant varietal distinction.

MENISPERMACEAE.

Disciphania mexicana *Bullock*, sp. nov.; species mexicana, distincta, foliis magnis profunde lobatis, endocarpio costato papillis paucis inter costis instructo.

Herba scandens, probabiliter volubilis, leviter pubescens vel glabra, caulibus gracilibus teretibus longitudinaliter multistriatis internodiis circiter 13 cm. longis. *Folia* herbacea, longe petiolata, petiolis 10–15 cm. longis striatis, ambitu suborbicularia, circiter 20 cm. diametro, profunde palmato-lobata, lobis 4–6 integris vel plus minusve lobulatis, apice acuminatis, utraque pagina leviter pubescentia, sinus basalis profundus clausus. *Inflorescentia* ex axillis foliorum orta, ut videtur spicata; flores masculi; flores feminei *Infructescentia* circiter 6 cm. longa, dense spicata, pedunculo 1.5 cm. longo. *Fructus* plus minusve ellipsoidei, circiter 1.3 cm. longi et fere 1 cm. diametro; exocarpium carnosum; endocarpium ambitu ovatum, dorsiventraliter concavo-convexum, costis irregularibus longitudinalibus 3 lateralibus et 1 dorsiventralis praeditum, inter costis papillis paucis irregulariter dispersis obtectum.

STATE OF MEXICO. Luvianos, District of Temascaltepec, a vine on the llano, 13 July 1933 (fr. and young ♂ flowers), *Hinton* 4314.

This plant represents an interesting northward extension of the range of the genus, and for this reason it was thought advisable to describe it from the available material though this is somewhat inadequate. Up to the present 12 species have been described, 9 from northern South America, 1 from Haiti, and 2 from Honduras.

The endocarp is very characteristic, having, as in other species of the genus, the general shape of a sector of a hollow sphere; it has three lateral irregular ridges at each side, and one front and back. There are also a few small scattered protuberances between the lateral and median ridges. The specimen cited above shows an infructescence and a very young inflorescence, probably male.

CAPPARIDACEAE.

Cleomella Hemsleyana *Bullock*, nom. nov.—*Cleome mexicana* Hemsl. Diag. Pl. Nov. pars alt. 20 (1879), et Biol. Centr.-Amer. Bot. 1, 41 (1879); non *Cleomella mexicana* Sessé et Moc. ex DC. in DC. Prodr. 1, 237 (1824)

STATE OF OAXACA. "Dunes de la Côte Pacifique", fl. jaunes, *Galeotti* 3194 (type in herb. Kew.).

STATE OF GUERRERO: Acapulco (or vicinity), Oct, 1894—March 1895, *Palmer* 214 (in herb. Kew.)

Although maintaining the genus *Cleomella* in the "Biologia," Hemsley described this plant as a species of *Cleome*, section *Physostemon*. The trapeziform fruit renders the above transference necessary.

CARYOPHYLLACEAE.

***Drymaria grandis* Bullock**, sp. nov.; inter species congeneres habitu elatiore, floribus pro rata maximis distincta.

Herba elata ut videtur perennis, plus minusve scandens, usque ad 3 m. alta, glabra, vel primum parce puberula, ramosa. *Folia* opposita, petiolis 5-8 mm. longis praedita, ambitu plus minusve rotundata, usque ad 2 cm. diametro, apice breviter cuspidata, basi rotundata usque breviter cuneata, e basi 3-nervia, venis secundariis haud distinctis, utraque pagina glabra vel fere glabra, leviter discoloria; stipulae subulato-lanceolatae, parvae. *Flores* in cymis terminalibus paniculiformibus plus minusve pedunculatis plus minusve glanduloso-puberulis dispositi; bractae parvae, triangulari-lanceolatae, 3 mm longae, acutae; pedicelli 7-12 mm. longi, in statu fructifero reflexi. *Sepala* 5, lanceolata vel ovato-lanceolata, 6.5 mm. longa, 2.5 mm. lata, acuta, 3-nervia, marginibus albidis scariosis. *Petala* 5, alba, obtriangularia, 8 mm. longa, apice truncata, profunde 3 fida, lobis plus minusve denticulatis. *Stamina* 5, inclusa, filamentis 6 mm. longis, antheris linearibus 0.75 mm. longis. *Ovarium* ambitu rotundatum 1.5 mm. diametro, apice plus minusve emarginatum, longitudinaliter 3 sulcatum; stylus apice trifidus, vix 1 mm. longus. *Capsula* ambitu oblonga, 6 mm. longa, in valvis 3 apice truncatis dehiscens. *Semina* 20-25, brunnea, testa prominente papillosa, reniformi-globosa a latere compressa, 0.75 mm. diametro; embryo periphericus.

STATE OF MEXICO. District of Temascaltepec: Comunidad, April 1932, *Hinton* 508; *ibid.*, 2300 m., in a barranca, Oct. 1933, *Hinton* 4919; *ibid.*, 2440 m., in a wet barranca "leaning on other plants", Jan. 1934, *Hinton* 5427 (type); Los Hornos, 2500 m., common in damp sites at this altitude, "a vine-like herb 3 m. high leaning on other plants", Nov. 1933, *Hinton* 5074; *ibid.*, 2550 m., Jan. 1934, *Hinton* 5429; *ibid.*, 2600 m., in a pine forest, Dec. 1932, *Hinton* 2811.

Besides the above species, which is remarkable for the great size it attains, Mr. Hinton has collected *Drymaria cordata* Willd., *D. gracilis* Cham. et Schlecht., *D. longepedunculata* S. Wats., *D. pauciflora* Bartl., and *D. villosa* Cham. et Schlecht. all in the same district.

HYPERICACEAE.

***Hypericum Spragueanum* Bullock**, nom. nov.—*H. fastigiatum* H.B. K. Nov. Gen. et Sp. 5, 195 (1822); Hemsl. Biol. Centr.—Amer.

Bot. 1, 83 (1879) ; non S. Elliot, Sketch Bot. S. Carolina and Georgia, 2, 31 (1821).

STATE OF MEXICO. District of Temascaltepec : Cerro Muñeca, \pm 2300 m., Aug. 1932, *Hinton* 1361 ; Tejupilco, 1340 m., Aug. 1933, *Hinton* 4600.

Barnhart* has discussed the dates of publication of the several parts of each of the works in which the name *Hypericum fastigiatum* was proposed. On his evidence, which appears to be conclusive, the Mexican plant requires a new name.

Hypericum Hintoni *Bullock*, sp. nov.; *H. paucifolium* S. Wats. similis sed foliis subulato-linearibus numerosioribus (internodiis brevioribus), paginis haud pellucido-punctatis sed ductibus longitudinalibus resinosis praeditis satis distincta.

Herba perennis, glabra, circiter 40 cm. alta ; caules simplices vel apicem versus (regione florifero) leviter ramosi, manifeste 4-angulati, angulis plerumque angustissime alati, internodiis circiter 1.5 cm. longis manifeste resinosis-punctatis. *Folia* opposita, decussata, lineari-subulata, usque ad 3.5 cm. longi et basi 2.5 mm. lata, sed plerumque minora, apice acuta, nervis lateralibus venisque haud distinctis, sed ductibus longitudinalibus resinosis manifeste lineata, et interdum marginaliter parce pellucido-punctata, superne valde redacta et bracteiformia. *Flores* cymosae vel ex axillis foliorum redactorum solitaires, in paniculis paucifloris terminalibus dispositi : pedicelli 2.4 mm. longi. *Sepala* 5, lanceolata, acuta, 3 mm. longa. *Petala* 5, obovata, apice rotundata, 5 mm. longa. *Stamina* numerosa, basi in phalangibus 5 disposita, filamentis 3 mm. longis, antheris globosis vix 0.5 mm. diametro. *Ovarium* ellipsoideum, 2 mm. longum, 1 mm. diametro ; styli 3, divergentes, 1.5 mm. longi. *Capsula* ellipsoidea, acuta, 7.5 mm. longa, 2.5 mm. diametro, in valvis 3 dehiscens. *Semina* numerosa, rubro-brunnea, cylindrica, vix 1 mm. longa, papillis minutis multiseriatis longitudinaliter lineata.

STATE OF MEXICO. District of Temascaltepec : Puerto Salitre. 1300 m., Sept. 1932, *Hinton* 1796 (type) ; Nanchititla, llano, Aug. 1934, *Hinton* 6518 ; Cañitas-Salitre, Aug. 1934 (" see 1796 from same place"), *Hinton* 6731.

This is very similar to *H. paucifolium* S. Wats. in habit, but is strikingly different in its leaves. The inflorescence is also laxer and forms a much less distinct panicle owing to the gradual reduction of the leaves to bracts, a change which is abrupt in *S. paucifolium*.

THEACEAE.

Ternstroemia Pringlei (*Rose*) *Standley* in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 234 (1929). *Taonabo Pringlei* *Rose* in Contr. U.S. Nat. Herb. 8, 322 (1905), *Standl.* in Contr. U.S. Nat. Herb. 23, 821 (1923).

* Barnhart in Bull. Torrey Club, 28, 680 (1901) et l.c. 29, 585 (1902).

STATE OF MORELOS. Sierra de Tepoxtlán, 2250 m., a small tree, Mar. 1899, *Pringle* 8013 (type number in Herb. Kew.) woodlands above Alarcon station, 1800 m., June 1904, *Pringle* 11932.

STATE OF MEXICO. District of Temascaltepec: Rincón mine, a tree, Feb. 1932, *Hinton* 281; Rincón, 2060m. at the top of the "Tuna" hill, May 1932, *Hinton* 646; *ibid.*, 1960 m., March 1934, *Hinton* 5606; Las Mesas, 2000 m., on a dry hill, a small tree, the preferred site of many orchids, April 1933, *Hinton* 3728; Cumbre, 2800 m., tree 10 m. high, with *Alnus*, *Quercus*, *Pinus*, etc., April 1934, *Hinton* 5914.

Also (*teste* Standley) in the state of Michoacan.

VERNACULAR NAME. Trompillo (*Hinton*).

The specimens collected by Mr. Hinton indicate that the position of the bracteoles, used by Standley as key character, is of no value for diagnostic purposes.

Eurya Benthamiana *Bullock*, nom. nov.—*Freziera integrifolia* Benth. Pl. Hartw. 6 (1839). *Cleyera integrifolia* (Benth.) Planch. ex Choisy in Mém. Soc. Phys. Genève, 14, 112 (1855); Hemsl. Biol. Centr.-Amer. Bot. 1, 93 (1879). *Eurya integrifolia* (Benth.) Szyszyl. in Engl. et Prantl. Nat. Pflanzenfam. 3, 6, 189 (1893), non Blume (1856). *E. mexicana* Standl. in Contr. U.S. Nat. Herb. 23, 823 (1923) partim, quoad syn. tantum, non *Tristylum mexicanum* Turcz. (1858) nec *Eurya mexicana* (Turcz.) Szyszyl. (1893).

This species is distinguishable by its velutinous sepals from its nearest ally, *E. syphilitica* (Choisy) Szyszyl. and also from *E. mexicana* (Turcz.) Szyszyl., with which Standley united it. From the latter it also differs in its larger, less numerous flowers, and its entire leaves. *Eurya Benthamiana* is represented at Kew only by the type specimen, collected by Hartweg (no. 18) at Bolanos, Zacatecas, in 1839.

Eurya syphilitica (Choisy) Szyszyl. in Engl. et Prantl. Nat. Pflanzenfam. 3, 6, 189 (1893). *Cleyera syphilitica* Choisy in Mém. Soc. Phys. Genève. 14, 112 (1855). *Ternstroemia syphilitica* Pavon ex Choisy *l.c.* in syn.

STATE OF MEXICO. District of Temascaltepec: Rincón, Feb. 1932 (fl.), *Hinton* 116, 282; El Crucero, 2880 m., a tree, July 1932 (fr.), *Hinton* 1099. La Labor, a tree 15 m. high, July 1935 (fl.), *Hinton* 7704; *ibid.*, Feb. 1935 (fr.), *Hinton* 7227; Comunidad, tree 10 m., Aug. 1935 (fl.), *Hinton* 7990. "Fruit edible".

VERNACULAR NAME. Capulincillo (*Hinton*).

Standley omitted this species from his "Trees and Shrubs of Mexico"; it had also been omitted from Hemsley's enumeration in the *Biologia Centrali-Americana*.

Eurya Hintoni *Bullock*, sp. nov.; *E. syphiliticae* (Choisy) Szyszyl. affinis, sed foliis floribusque minoribus, antheris longius apiculatis pedunculis apice bibracteolatis differt.

Arbor sempervirens, 10 m. alta, ramis ramulisque glabris sed lenticellis numerosis tuberculatis. *Folia* coriacea, glaberrima, anguste

elliptica vel rarius ovata, 4-8 cm. longa, 1.5-3 cm. lata, apice obtuse sub-acuminata, basi subcuneata, supra nitida, subtus nervis lateralibus (utrinsecus 5-9) venisque manifestis reticulata; petioli 1-3 mm. longi. *Flores* numerosi, ex axillis foliorum maturorum vel delapsorum orti, 1-3-nati; pedunculi satis graciles, circiter 1 cm. longi, apice bibracteolati; bracteolae suboppositae, triangulari-ovatae, circiter 0.5 mm. longae, plus minusve ciliatae; receptaculum (supra bracteae) plus minusve turbinatum, 2 mm. altum, 1.5 mm. diametro. *Sepala* 5, biseriata, 3 exteriores semielliptica, apice rotundata, marginibus pilis paucis ciliata, ceterum glabra, 2 interiores rotundato-ovata, omnino glabra; omnia circiter 2 mm. longa et 2 mm. lata, sub anthesin patentes. *Petala* 5, rotundato-obovata, 5 mm. longa, 4 mm. lata, sub anthesin patentes, marginibus plus minusve incurva. *Stamina* circiter 30, in annulo corollae basi inserta; filamenta tota 3.5 mm. longa, circinnatim incurva; antherae 1 mm. longae, connectivo in apiculo fere 1 mm. longo producto. *Ovarium* globosum, fere 1.5 mm. diametro, leviter breviter pilosum. *Styli* 2, lineari-filiformes, 3 mm. longi. *Fructus* non visi.

State of MEXICO. District of Temascaltepec: Mina de Agua, in a barranca, a tree 10 m. high, Nov. 1935 (fl.), *Hinton* 8653.

XXXVII—MISCELLANEOUS NOTES

MR. ALFRED H. COCKAYNE.—We note with interest that Mr. A. H. Cockayne, son of the late Dr. Leonard Cockayne, C.M.G., F.R.S., who has been Assistant Director-General of the Department of Agriculture, New Zealand, since 1929, has been appointed Director-General in succession to Dr. C. J. Reakes.

In 1927 Mr. Cockayne was appointed Director of the Plant Research Station on its establishment and he retained this post during his tenure of the office of Assistant Director-General.

SIR LIONEL PHILLIPS.—Botany in South Africa has sustained an irreparable loss in the death of Sir Lionel Phillips, Bart., at his home near Somerset West, South Africa, on July 2nd, at the advanced age of 80. After a long and adventurous life in the South African goldfields, he became keenly interested in all matters pertaining to Agriculture and Horticulture, in which interests he was ably supported by Lady Phillips, who is herself an enthusiastic gardener. Thanks to Sir Lionel's assistance and influence, the late Professor Pearson's scheme for establishing a Botanic Garden at Kirstenbosch was realised. When Sir Lionel represented Yeoville, Transvaal, in the South African Parliament (1910-1915), he moved the following resolution: "That in the opinion of this House, the Government should consider the advisability of setting aside a piece of ground at Kirstenbosch for the establishment of a National Botanic Garden." The motion received unanimous support from the House, and the Government promptly acted in accordance therewith.

Sir Lionel was also a life-member of the Botanical Society of South Africa, having acted as Vice-President since its foundation in 1913, and as Chairman of the Council since 1927. To his constant interest and support the Society owes much of its success.

At their beautiful home, "Vergelegen", Sir Lionel and Lady Phillips for some years have carried out interesting farming experiments. Their library, which was housed in the converted old Cape-Dutch wine store, contained a valuable collection of books on various branches of natural history.

Sir Lionel was also very fond of music and the fine organ he had built in his library added greatly to its interest.

FREDERICK JOHN FRESHWATER SHAW.—The sudden death at Agra, announced in the London papers of 31st July last, of Dr. F. J. F. Shaw, C.I.E., A.R.C.S., F.L.S., Director of the Imperial Institute of Agricultural Research, Pusa, removes one of the few members remaining in India who were associated with the early days of the Indian Agricultural Service.

Dr. Shaw joined the Service in 1910, after completing his research training in botany and plant pathology at the Royal College of Science. He was posted to Pusa as Supernumerary Mycologist and engaged in plant pathological research for which he received the degree of D.Sc. (London). In 1913 he served as Government Mycologist in Madras, but returned to Pusa as Second Imperial Mycologist in 1915. In 1928 he became Imperial Economic Botanist and in 1934 Director of the Pusa Institute. In this capacity he was responsible for the arrangements for the transfer of the Imperial Agricultural Research Institute, destroyed by the Bihar Earthquake, to its new home near Delhi. It was during one of the journeys in connection with this transfer that he lost his life from apoplexy brought on by the heat of the Indian plains at that time of the year. He had been at Simla, acting as Agricultural Expert with the Imperial Council of Agricultural Research, for some time prior to his death.

Dr. Shaw, who was fifty at the time of his death, was educated at St. Olave's Grammar School, London. He received the C.I.E. this year. He published a number of papers on plant pathology and plant breeding, mainly in the Memoirs and other publications of the Department of Agriculture in India.

E. J. BUTLER.

Centenary of the University of London.—The Director attended the Centenary Celebration on Monday, June 29th, when the Chancellor received the Delegates to the number of 190 and conferred the Honorary Degrees. The Delegates presented Addresses of Congratulation and the following address was presented by the Director from the Royal Botanic Gardens, Kew.

**On the Occasion
of the
Centenary of the University of London.**

The Director and Staff of The Royal Botanic Gardens, Kew, offer their sincere congratulations, fully recognizing the great work which the University has done in stimulating and encouraging University Education, not only in England but throughout the Empire.

The Royal Botanic Gardens are proud of their many connections and points of contact with the University, since in attempting to display the botanical resources of the world, and of the Empire in particular, Kew may be considered ancillary to the University in many of its spheres of activity.

We look forward to the future of the University in its new home and offer our best wishes for the continued spread of its beneficent influence.

It is our earnest wish that the students of the University may always find refreshment for mind and fresh sources of inspiration during their studies and their leisure among the beauties of Nature at Kew.

June 27th, 1936.

ARTHUR W. HILL
Director.

Centenary of the Botanical Society of Edinburgh.—The Centenary meeting of the Society was held at Edinburgh on July 1st, in the Lecture Hall of the Royal Botanic Garden. The Delegates were received by the President, Sir William Wright Smith, F.R.S.E., at 10 a.m., when addresses were presented. The Director was the official delegate from Kew and presented the following address of congratulation : —

**From
The Royal Botanic Gardens, Kew
to
The Botanical Society of Edinburgh
Greeting.**

On the auspicious occasion of your Centenary we gratefully recall how your Society, from its foundation, has promoted the study of Systematic Botany under the stimulus of your first President, Robert Graham, and of such eminent botanists as Robert Kaye Greville, John Hutton Balfour, Hewett Cottrell-Watson, William Lauder Lindsay and Richard Spruce.

The impetus thus given to the study of Botany has been ably sustained during the past hundred years of your existence and has covered a wide field of botanical investigation, especially among the Cryptogams, both at home and abroad.

Not only has the Society published important monographs, but it has also encouraged the publication of many smaller papers, the interest and value of which, coupled with the flourishing condition of your membership are a fine testimony to your vigour.

It is, we feel, a happy augury for the future that your Secretary is a member of the Clan of your original President, and in tendering you our Congratulations we also offer you our Good Wishes for your continued usefulness and prosperity.

July 1st, 1936

ARTHUR W. HILL
Director.

Emeritus Prof. F. O. Bower, F.R.S., then delivered a very interesting address dealing with the progress of the Science of Botany during the century of the Society's existence in its relation to the history of the times. The Centenary Luncheon was given in the Upper Library of the Old College. The Lord Provost and many other distinguished visitors were present. Lord Aberconway proposed the toast of the City of Edinburgh, Professor Sir Albert Seward that of the Society, and the Director responded on behalf of The Guests.

The afternoon was spent in visiting the Royal Botanic Garden and the botanical exhibition which had been arranged in the Laboratory.

In the evening there was a civic reception by the Lord Provost and the Corporation in the City Chambers.

Chronica Botanica.†—Greatly increased specialisation is characteristic of modern scientific research, with the result that workers in one branch are often badly informed as to developments in other departments of their own science. Except in the United States of America, where a system of exchange of research programmes is in operation, there is little opportunity to exchange notes on current investigations. *Chronica Botanica*, now in its second year, was founded primarily to collect and publish such programmes.

The second volume maintains the high standard set by its predecessor. The main body of the book (pp. 65-369) is devoted to a review of all branches of plant science for the year 1935, no information being reprinted from the previous volume. This section gives all the scientific and personal news collected up to the end of January 1936, and at the same time forms an up-to-date list of the addresses of all institutions and societies in any way concerned with pure or applied botany.

Here only a few examples can be given of the varied information supplied in this section. In Alaska, weed control in the grain fields is becoming a major problem, while in Hungary the increase in the growing of arable crops, accompanied by a ploughing up of the better grassland areas, has caused a serious diminution in the

† *Chronica Botanica*, edited by Fr. Verdoorn. Volume II. (*Chronica Botanica*, Ltd., P. O. Box 8, Leiden, Holland, 1936). Pp. 479, and numerous portraits and illustrations in the text. Price 15 guilders. London Agents: H. K. Lewis and Co., 136 Gower Street, W. C. 1.

extent and quality of the pastures. The task with which Hungarian grassland farmers are now faced is to improve the nutritive value of their grazing grounds, and thus to reduce the costs of obtaining animal products. It is generally assumed that the future of Brazil is closely bound up with the development of cotton cultivation, and a national cotton research association is now projected in that country. In France, a new nature reserve has been established in the central Pyrenees, under the direction of Dr. P. Chouard. The area consists of 21 square kilometres of mountainous country, between 1750 and 3090 m. in altitude, and is intended not only for the protection of the native flora and fauna, but for investigations in mountain biology. Various nature reserves have also been established in Java, Sumatra and Borneo. Numerous illustrations reproduced from photographs include portraits of recently deceased botanists, e.g. Cardot, Jumelle, Flahault, Loeske, Hans Meyer, O. V. Darbishire, F. Escombe, John Fraser, Paul Brühl, Ugolino Martelli, Hugo de Vries, F. A. F. C. Went, Hugo Dahlstedt, F. G. Stebler, A. Fomin, A. S. Hitchcock and B. L. Robinson, accompanied by brief obituaries. Portraits of deceased collectors include those of Père Vanderijst, Chaplain Clemens and W. E. Broadway, and others represent botanists who have received new appointments, e.g. E. J. Butler, G. W. Turesson, E. D. Merrill, M. L. Fernald and M. A. Howe.

The editorial article is devoted to an account of the little-known Botanical Section of the International Union of Biological Sciences, while the results of the Sixth International Botanical Congress, Amsterdam (1936), are summarized in pp. 27-41. Notices of international and important congresses, committees, societies and institutions occupy pp. 42-64. Other useful features are Discussions and Announcements (370-374), New Periodicals (376-378), and New and Changed Addresses (379-406). The volume ends with separate Indexes of Place Names, Plant Names and Persons (444-479). No important botanical institution can afford to be without it.

T. A. SPRAGUE.